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OPACITY OF SILICON-HYDROGEN MIXTURES

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA Lewis Research Center
Contract NAS 3-13461

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FINAL REPORT

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ABSTRACT

The equilibrium compositions, linear spectral absorption coefficients, and Planck and Rosseland mean absorption coefficients have been computed for silicon-hydrogen mixtures with silicon/hydrogen mass ratios of 0., 0.005, 0.01, and 0.05, temperatures of 1600, 2200, 3000, 4000, 5000, 6500, 8000, and 10,000° K, and gas pressures of 100, 500 and 1000 atmospheres for the wave number range 7000 - 68,000 cm^{-1} (approximately). The possible presence of solid silicon has been considered in the composition calculations, but not in the calculations of the optical constants. The major absorption was found to be due to molecular electronic transitions, photodetachment, photoionization, and neutral free-free processes, although each contributed strongly only for limited combinations of the temperatures, pressures, Si/H mass ratios, and spectral frequencies considered, of course. The presence of condensed (either solid or liquid) silicon in some of the mixtures is definitely indicated; this could have great consequences for the optical constants of the mixtures and their utility as heat-absorbing media in proposed gaseous-core nuclear rocket propulsion systems. Comparison* of the opacities of the Si/H system with those from the comparable C/H system indicates that an appropriate combination of Si, C and H could produce an essentially grey absorber gas.

*Suggested by Dr. Richard W. Patch, NASA-LRC.

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SUMMARY

The purpose of this work is to calculate the optical constants (spectral absorption coefficients and Planck and Rosseland mean absorption coefficients) of silicon-hydrogen mixtures for application to the design of gaseous-core nuclear rocket propulsion systems. This work is a follow-on to the similar work on carbon-hydrogen mixtures performed by The KMS Technology Center (then known as Heliodyne Corporation) under contract NAS 3-11842 and reported in Roger P. Main, Optical Constants of Carbon-Hydrogen Mixtures. NASA CR-72570 (May 20, 1969). The present and preceding works complement the work of Patch on pure hydrogen (R. W. Patch, Interim Absorption Coefficients and Opacities for Hydrogen Plasma at High Pressure. NASA TM X-1902 (October, 1969)), and of the University of Georgia group on optical absorption of solid seed materials (A. S. Shenoy, J. R. Williams, and J. D. Clement, Measurements of the Extinction Parameters of Hot Seeded Hydrogen at One Atmosphere Pressure, NASA CR-1504 (February 1970)). Seeding of the hydrogen propellant gas in proposed gaseous core nuclear reactor rocket propulsion systems is necessary in order to obtain adequate radiative heat transfer to the propellant gas and to protect walls and support structures from the intense radiant heat flux emanating from the extremely high temperature core.

We have calculated the equilibrium compositions, and from these the optical constants, for silicon-hydrogen mixtures for total gas pressures of 100, 500, and 1000 atmospheres, gas temperatures of 1600, 2200, 3000, 4000, 5000, 6500, 8000, and 10,000° K, with silicon/hydrogen mass ratios of 0., 0.005, 0.01, and 0.05, a total of 96 cases. The computer calculations of equilibrium compositions include 19 species, among them solid silicon. The computer calculations of the optical constants include absorption by electronic transitions in the H_2, SiH, SiH^+, Si_2, SiH_2, and Si_3 molecules, photoionization absorption by H and Si atoms, radiative association absorption by H atoms, photodetachment absorption by H^- and Si^- ions, and free-free absorption by electrons in the fields of neutral and singly-ionized species. The cases where the silicon/hydrogen mass ratio is zero, i.e., where the mixture is hydrogen gas, are included for reference only, and are not intended to supplant more accurate calculations of the compositions and opacities of hydrogen gas reported in the literature.

The composition calculations revealed that solid silicon was present in the mixtures for some cases with gas temperature T = 1600° K.

The principal species in the mixtures are H_2, H, SiH_2, and SiH_3 at the lower temperatures considered, and H_2, H, Si, H^+, H^-, Si^+, SiH, and SiH^+ at the higher temperatures considered. The optical absorption is principally due to electronic transitions in molecules, photoionization of H and Si atoms, photodetachment from H^- ions, and the free-free processes for neutral species, the contribution of each varying with the gas conditions, of course. Thermodynamic and spectroscopic data are lacking for several potentially important molecular species. The optical constants exceed 1. cm^{-1} by a goodly amount at the highest temperatures and pressures considered, a major factor to be considered in the design of nuclear propulsion systems using silicon-seeded hydrogen as propellant gas. The presence of condensed (solid or liquid) silicon in the mixtures at the lower temperatures considered, a feature of great importance for radiative heat transfer in proposed gaseous core nuclear propulsion systems if true, requires further studies of the three-phase equilibrium of the silicon-hydrogen system to eliminate uncertainties caused by lack of adequate thermochemical data for this system.

It has been observed by the NASA Project Manager for this program, Dr. Richard W. Patch, that an overlay of the spectral opacities computed for the present Si/H system, along with those previously computed for the C/H system, yields a nearly uniform opacity. This observation indicates that the primary hydrogen gas, when seeded with a Si/C mixture, would produce a nearly grey absorbing gas. Future analyses should be directed towards such a chemical system.

INTRODUCTION

The optical constants (spectral absorption coefficients, spectral emissivities, and spectrally-averaged opacities of various types) of complex equilibrium gas mixtures are of great interest in many fields, including astrophysics, missile-reentry physics, and nuclear rocket technology. The state-of-the-art of the theoretical calculations has now advanced to the stage where many meaningful calculations of the optical constants of complex gas mixtures can now be routinely undertaken with the aid of large computers; the principal uncertainties in these calculations arise from our lack of adequate experimental knowledge of the spectra and thermochemistry of the atoms, molecules, and condensed phases present in the mixtures.

To calculate the optical constants of a complex equilibrium gas mixture one must first calculate its equilibrium species composition. This requires computer calculations, usually based on free-energy minimization, for the temperatures, pressures, and initial compositions of interest. With the equilibrium species compositions in hand, the optical constants can then be calculated utilizing detailed information on the intensities and spectral distributions of the important radiative and absorptive processes. For complex gas mixtures, usually many such processes must be taken into account. For example, in the work of the present author for carbon-hydrogen mixtures[1] under the conditions of temperature and pressure considered here, 16 electronic band systems in diatomic molecules, 23 electronic band systems in triatomic and polyatomic molecules, photodetachment from C^- and H^- negative ions, photoionization absorption by C and H atoms, free-free processes involving positive ions and neutral species, and radiative association of hydrogen atoms were taken into account. It is necessary in such calculations to make many approximations, partly to keep their complexity within reasonable bounds, and partly to take account of the inaccurate and inadequate experimental and theoretical data that must be used in them. The theoretical calculations of opacities for complex high-temperature gas mixtures generally cannot be compared with experimental data, due to the lack of the latter. This is particularly true of the present calculations, where no experiments have yet been performed on gas mixtures approximating those considered here. For these reasons, it is important to take note of the qualifications and uncertainties to be named and discussed later in making engineering use of the results represented here.

In the present work we calculate the equilibrium compositions and optical constants (linear spectral absorption coefficients and

Planck and Rosseland mean opacities) for silicon-hydrogen mixtures specified by all combinations of the following conditions:

Silicon/Hydrogen Mass Ratio = 0.,0.005, 0.01, and 0.05

Gas Temperature = 1600, 2200, 3000, 4000, 5000, 6500, 8000, and 10,000° K

Total Gas Pressures = 100, 500, and 1000 atmospheres,

a total of 96 cases in all. The equilibrium compositions are calculated using a standard computer program for an assumed set of final species, including solid silicon. The optical constants are calculated using a computer program developed by the present author which takes account of the important radiative absorption mechanisms for all species for which adequate quantitative spectroscopic data exist. This is the first theoretical study of this nature for silicon-hydrogen mixtures, and its results are intended to be of use in the design of gaseous-core nuclear rockets. It will be important in this connection to define as accurately as possible the uncertainties existing in the calculations reported herein, since engineering decisions should take such uncertainties into account.

The present work is a follow-on to theoretical calculations of the optical constants of carbon-hydrogen mixtures performed by the present author under Contract NAS 3-11842[1]. The conditions of temperature, pressure, and mass ratio considered here are identical to those considered in the preceding work, excepting that reference cases for pure hydrogen gas have been introduced into the present work. These two works complement the works of Patch on pure hydrogen[2, 3], and of Shenoy, Williams, and Clement[4] on absorption by solid seed materials in hydrogen gas. These works are important for the design of gaseous-core nuclear rocket propulsion systems which use a propellant of seeded hydrogen gas in order to achieve optimal deposition of the intense radiant heat flux from the extremely hot core in the propellant fluid with adequate protection of walls and structures from this intense heat flux. The status of work in this area has recently been reviewed by Patch[5].

The main results of this work are given in the present report, and a copy of the print-out of the computer calculations of equilibrium compositions is given herein. The complete print-out of the optical

constants, which includes columns giving the contributions due to each molecular band system and each absorption mechanism for each mixture, has not been given in the present report due to its great length (c. 800 pages), but discussion of this sufficient for most purposes is given in the text here. The reference cases for pure hydrogen gas (Si/H mass ratio = 0.) are included only for sake of comparison with the other results, and are inferior in accuracy to several other such calculations reported in the literature or in process of preparation (e.g. those of Patch [2, 3]).

CALCULATIONS OF COMPOSITIONS

The HUG Composition Program

The equilibrium compositions of the carbon-hydrogen mixtures of interest were calculated with the HUG computer program[6], which computes the equilibrium composition of reactive gas mixtures for specified end conditions of temperature and pressure through minimization of the thermodynamic free-energy subject to conservation conditions, including a simultaneous consideration of a two-phase equilibrium with the single-phase equilibrium of the gaseous species. The input data to the HUG program are the dimensionless enthalpies and free energies and the heats of formation (at 0° K) of the species to be included in the equilibrium composition calculations, the initial species composition of the mixtures, and the final temperatures and pressures desired.

For the composition calculations, we have transformed the Si/H mass ratios to be considered to initial mole fractions which sum to unity, as required by the HUG computer program. Using the standard atomic weights (chemical scale) for Si (28.086 gm/mole) and H (1.00 797 gm/mole), we find:

Si/H Mass Ratio	Initial mole fractions Si	H
0.	0.	1.0000000
0.005	0.0001796	0.9998204
0.01	0.0003587	0.9996413
0.05	0.0017912	0.9982088

These values for the initial mole fractions have been used in the composition calculations of the present work.

We have written at The KMS Technology Center a computer program to compute fourth-degree polynomial temperature fits to the thermodynamic functions of species for use with the HUG program. This computer program generates "least squares" best temperature fits to tabular data for the dimensionless enthalpy, $(H^{\circ}_T - H^{\circ}_0)/RT$, and the dimensionless free energy, $(F^{\circ}_T - H^{\circ}_0)/RT$ in the formats required by the HUG program. Much of the available thermodynamic data for the species of interest here extends (or is valid) only to $T = 6000^{\circ}K$ or less (cf. Table 1). In order to perform the composition calculations we have extrapolated these data, through the fit coefficients obtained, up to the highest temperature considered here, $T = 10,000^{\circ}K$, even though the validity of this process is highly questionable. This will introduce unknown errors into our composition calculations, but no alternative to this approach is available.

Species Considered

The choice of species to be considered in the composition calculations has been based on the author's conjectures of those expected to be present in the mixtures considered for the conditions of interest and on the availability of the required thermodynamic functions. The species listed in Table 1 have been included in the composition calculations. A complete listing of the fit coefficients used are given in Appendix B to this report.

Condensed Phases

There is for some of the temperatures and pressures considered the possibility that silicon will condense in the mixtures of interest. This possibility can be considered by the HUG computer program for a single condensed phase. The HUG program assumes that the condensed phase has a constant molar volume over the temperature and pressure ranges considered in the equilibrium composition calculations, and it ignores the small effects of pressure on the enthalpy and chemical potential of the condensed phase. With these assumptions, the HUG program attempts to satisfy the equilibrium conditions assuming that the condensed phase is present; when unable to do so, it is determined that the mole number of the condensed phase is zero. For the conditions of interest here there is the possibility that silicon may condense in either solid or liquid form (or both). The requisite thermodynamic functions

TABLE 1

SPECIES CONSIDERED IN THE COMPOSITION CALCULATIONS.

Species (Chemical formula)	Thermodynamic data Source (Footnote No.)	Remarks (Footnote No.)
Si(g)	1	7
H	1	7
H_2	1	7
SiH	1	7
SiH_2	2	7
SiH_3	2	7
SiH_4	1	7
Si_2	1	7
Si_2H_6	3	8
Si_3	1	7
e^-	1	7
Si^+	4	—
Si^-	5	—
H^+	1	7
H^-	1	7
H_2^+	6	—
H_3^+	6	—
SiH^+	5	—
Si(c)	1	7

Footnotes to Table 1

1. Tabular data and $\Delta H_f(T = 0^\circ K)$ taken from JANAF Thermochemical Tables, The Dow Chemical Company, Midland, Michigan (August, 1965), and from the first and second addendums thereto, dated, respectively, August, 1966, and

August, 1967.

2. Tabular data and ΔH_f (T = 0° K) from unpublished work supplied to us by Dr. R. Watson of TRW Systems, Inc., Redondo Beach, Calif.

3. Tabular data taken from M. Pfeiffer and H. J. Spangenberg, Z. Phys. Chem. (Leipzig) 232, 47 (1966). We have estimated ΔH_f (T = 0° K) to be approximately 30 kcal/mole, and have used this value in our calculations.

4. Tabular data taken from J. W. Green, D. E. Poland, and J. L. Margrave, J. Chem. Phys, 33, 35 (1960). We have taken ΔH_f (T = 0°K) to be 293.68 kcal/mole from the value given for Si in the reference of Footnote 1, with an ionization energy for Si of 8.15 ev.

5. Thermochemical functions and ΔH_f (T = 0° K) have been hand calculated by the present author from spectroscopic data found in the literature - see Appendix A to this report.

6. Tabular data and ΔH_f (T = 0° K) taken from R. W. Patch and B. J. McBride, Partition Functions and Thermodynamic Properties to High Temperatures for H_3^+ and H_2^+. NASA TN D-4523 (April, 1968). These data were fitted over the temperature range 1000 - 10,000° K.

7. The tabular thermodynamic data were given only up to T = 6000° K. We have used our fourth-order polynomial fits to these data for the range up to the highest temperature (T = 10,000°K) considered in the present composition calculations.

8. The tabular thermodynamic data were given only up to T = 1500° K. We have used our fourth-order polynomial fits to these data up to the highest temperature (T = 10,000° K) in the present composition calculations.

exist for both solid and liquid silicon[7], but we have considered only the former in the present work. The possibility of solid silicon was considered for all temperatures and pressures and all mixtures containing silicon. The neglect of liquid silicon should not be important because the heat of fusion is only 14% of the heat of vaporization. Any condensed silicon that might be present in the mixtures considered is not to be considered in the calculations of their optical constants.

Discussion of Results

We give both tabular and graphical presentations of the results of the computer calculations of the composition of the silicon-hydrogen mixtures considered. The print-out of the HUG computer program is given as Appendix C to this report, and a hand-plot of some of this is given in Figure 1.

Probably the most significant result of the HUG composition calculations is that solid silicon was found in two of the mixtures considered. The condensed solid silicon was found only for gas temperature T = 1600°K, Si/H mass ratio = 0.05, and gas pressures P = 100 and 500 atm. The Si(c) mole fractions (relative to the total for gas-phase species) were 1.06×10^{-3} and $6. \times 10^{-4}$, respectively. This fact could have great consequences for the opacities of the mixtures considered. In addition, the three-phase equilibrium of silicon should be investigated to determine whether the liquid phase will be found in the mixtures we have considered.

We find from the results of the computer calculations (Appendix C) that the compositions of the mixtures are not greatly sensitive to the total gas pressure for the pressures considered, and that for each of the temperatures considered the mole fractions of most of the silicon-containing species scale approximately with silicon/hydrogen mass ratio, while the pure hydrogen species (e.g., H and H_2) have mole fractions at each temperature that are largely independent of the Si/H mass ratio and total gas pressure. This we would expect for the low Si/H mass ratios and pressure range considered. The compositions change rather markedly with temperature, however (Fig. 1). The mixtures considered are largely H_2, SiH_2, SiH_3, and SiH_4 at the lowest temperatures, and Si, Si^+, H, H_2, H^+, H^-, H_2^+ and free electrons at the highest temperatures. The mole fraction of free electrons in the mixtures considered is never much greater than 10^{-3}.

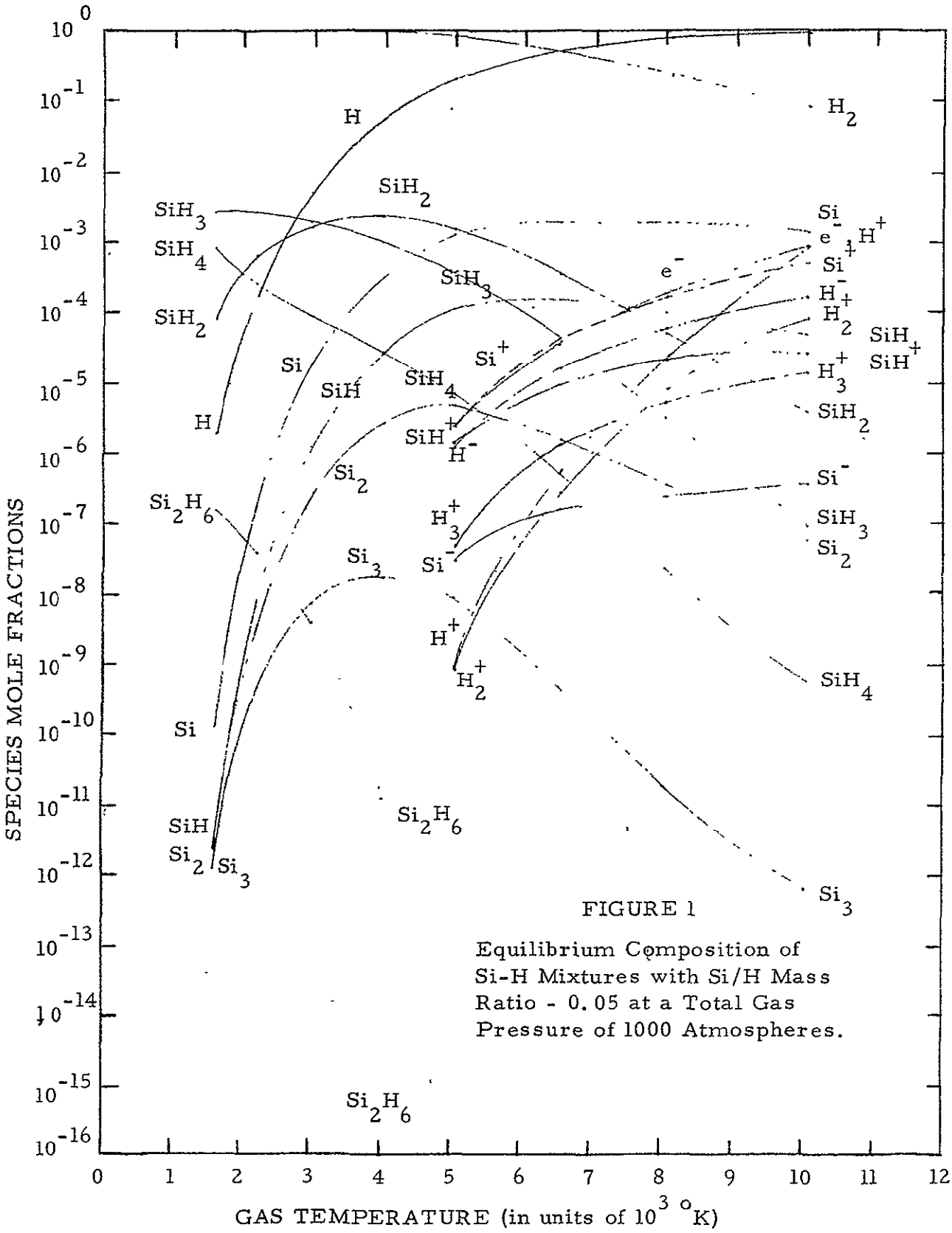

FIGURE 1

Equilibrium Composition of Si-H Mixtures with Si/H Mass Ratio - 0.05 at a Total Gas Pressure of 1000 Atmospheres.

Uncertainties in the Composition Calculations

There are some errors inherent in the calculations of the species composition, partly due to uncertainties in the ideal gas thermochemical functions and heats of formation of the lesser-studied species. Uncertainties here can also be caused by omission of important species from the calculations, but in addition, for the conditions of interest, we may have pressure dissociation effects, pressure ionization effects, ionization potential lowering by Coulomb interactions, non-ideal gas equation-of-state effects, and collective influences on the basic thermochemical properties of the system.

The major errors here in the present work probably arise from our total lack of thermodynamic data on several possibly important species, e.g., Si_2H, Si_2H_2, Si_2H_4, etc., and the uncertainties in the heats of formation of species such as SiH_2, SiH_3, and Si_2H_6. We cannot quantitatively assess these errors, but they could certainly have large influences on the computed compositions. Very clearly, the Si-H species have not been so thoroughly researched as have been the C-H species.[1] The other possible sources of errors have been adequately discussed in the preceding work[1], where it was found that they may give rise to errors of order 10 to 20% in the computed compositions. This is probably small compared to errors introduced due to the necessary omission of possibly important species from the composition calculations.

It appears that consideration should have been given to the three-phase equilibrium of silicon, rather than only to the restricted two-phase solid-gas system to which we are limited by the HUG computer program. Failure to consider the full equilibrium of silicon could affect our composition results for the lowest temperatures. We cannot quantitatively assess this effect without a detailed study of the full equilibrium of silicon in the presence of hydrogen gas. The thermodynamic functions of the many complex species that would be of importance in such a study are not available, and such a study could not be performed theoretically. An experimental study should be possible, however.

We must mention that the presence of solid silicon in the mixtures we have considered may be due to our inability to include several potentially important gas-phase species in our composition calculations. Thus, the calculated presence of solid silicon may be a false result. It is clear that a thorough experimental study of the Si-H system at low temperatures is necessary.

CALCULATIONS OF OPTICAL CONSTANTS

The Opacity and Spectral Absorption Computer Program

The Opacity and Spectral Absorption Computer Program (OPSAB)[8] was written at The KMS Technology Center by Arthur A. Anderson and Roger P. Main in 1966. There has been a continual improvement of this program since that time. To date this program has been used to compute spectral absorption coefficients and opacities of many different types of gas mixtures, including the carbon-hydrogen mixtures of the preceding work[1].

The OPSAB program gives local Planck mean spectral absorption coefficients, spectral volume emission, and several spectrally-integrated opacities for equilibrium gas mixtures composed of free electrons, atoms, their ions, and molecules and molecular ions when the gas mixture species composition is known. The program is heavily concerned with electronic transitions in molecular species, and this fact serves to define the ranges of temperature, gas pressure, and spectral frequency that may be considered. No consideration is given in the program to radiative absorption by condensed matter, for which a separate analysis is required. The composition of the gas mixture to be considered by this program must be known from separate calculations. The radiative absorption mechanisms considered in the OPSAB program in its present version are:

a. Electronic transitions in diatomic, triatomic, and polyatomic molecules.

b. Photodetachment from O^-, C^-, H^-, F^-, and Si^- ions (only Si^- and H^- are of interest in the present work).

c. Free-free transitions of electrons in the fields of neutral and ionized species.

d. Radiative association of hydrogen atoms by the process

$$H(1s)^2S + H(1s)^2S \left| b\,^3\Sigma_u^+ + h\nu \rightarrow H_2 \quad (a\,^3\Sigma_g^+) \right.$$

e. Photoionization of neutral O, N, C, Si, and H atoms (only Si and H atoms are of interest in the present work).

An essential feature of the program is its basic input data card deck containing all the necessary spectroscopic constants, Franck-Condon factors, and oscillator strengths for electronic transitions in diatomic molecules, and characterization parameters for electronic transitions in polyatomic molecules. The deck has been expanded to include electronic transitions in the SiH, SiH^+, Si_2, SiH_2, and Si_3 molecules.

The OPSAB program computes locally-averaged (Planck mean) spectral absorption coefficients for the processes named above for input conditions of temperature, pressure, and gas species composition (mole fractions). The lower and upper bound spectral frequencies and the spectral averaging interval for the calculations are specified in the input data, subject to the dimensional requirement that the number of spectral averaging intervals not exceed 36. Electronic transitions in diatomic molecules are treated by the "just-overlapping rotational line" model (equivalent to the "smeared line" model) of Patch, Shackleford, and Penner[9]; electronic transitions in triatomic and polyatomic molecules are treated by a simpler model which includes a "smearing-out" of the vibrational structure of the transitions[10]. Photodetachment and photoionization absorption are computed using input cross section data, and the free-free absorption is computed using the Kramers classical formula with unit Gaunt factor. An approximate method ("effective Z^{2}") is used to extend the free-free absorption calculations to transitions in the fields of neutral species. The H+H radiative association continuum absorption is computed using the model proposed by Erkovitch, as corrected by later works (cf. Ref. 1, p. 34).

A number of spectrally-averaged opacities listed below are given by the program, in addition to the local Planck mean absorption coefficients. The program also computes spectral emission intensities and the total emitted intensity of optically thin plane layers of gas; it can also modify the computed spectral absorption coefficients and emission intensities to take account of detailed balancing of radiative

processes in the "optically thick" limit. The program also computes the opacities for several "weighting temperatures" that can be different from the gas temperature. Only the Planck and Rosseland mean absorption coefficients are required in the present work, however.

Listing of Spectrally-Averaged Opacities
Computed by the OPSAB Program:

a. **Planck mean opacity (cm^{-1}):**

$$\bar{\mu}_P(T,T_R) = \frac{\int_{\omega_o}^{\omega_E} \mu_\omega'(T) B_\omega(T_R)\, d\omega}{\int_{\omega_o}^{\omega_E} B_\omega(T_R)\, d\omega}$$

b. **"Mean-squared Planck mean opacity":**

$$\bar{\mu}_P^{(2)}(T,T_R) = \frac{\int_{\omega_o}^{\omega_E} [\mu_\omega'(T)]^2 B_\omega(T_R)\, d\omega}{\int_{\omega_o}^{\omega_E} B_\omega(T_R)\, d\omega}$$

c. **Rosseland mean-free-path (cm):**

$$\Lambda_R(T,T_R) = \frac{\int_{\omega_o}^{\omega_E} \frac{1}{\mu_\omega'(T)} \frac{\partial B_\omega(T_R)}{\partial T_R}\, d\omega}{\int_{\omega_c}^{\omega_E} \frac{\partial B_\omega(T_R)}{\partial T_R}\, d\omega}$$

d. Reciprocal Rosseland mean-free-path (cm^{-1})(or Rosseland mean opacity):

$$\bar{\mu}_R(T,T_R) = \frac{\int_{\omega_o}^{\omega_E} \frac{\partial B_\omega(T_R)}{\partial T_R}\, d\omega}{\int_{\omega_o}^{\omega_E} \frac{1}{\mu'_\omega} \frac{\partial B_\omega(T_R)}{\partial T_R}\, d\omega} = \frac{1}{\Lambda_R(T,T_R)}$$

e. "Mean-squared Rosseland mean-free-path" (cm^2):

$$\Lambda_R^{(2)}(T,T_R) = \frac{\int_{\omega_o}^{\omega_E} \left[\frac{1}{\mu'_\omega(T)}\right]^2 \frac{\partial B_\omega(T_R)}{\partial T_R}\, d\omega}{\int_{\omega_o}^{\omega_E} \frac{\partial B_\omega(T_R)}{\partial T_R}\, d\omega}$$

f. I' (cm^2):

$$I' = \frac{\int_{\omega_o}^{\omega_E} \left[\frac{1}{\mu'_\omega(T)}\right]^2 \frac{\partial^2 B_\omega(T_R)}{\partial T_R^2}\, d\omega}{\int_{\omega_o}^{\omega_E} \frac{\partial^2 B_\omega(T_R)}{\partial T_R^2}\, d\omega}$$

Here $\mu'_\omega(T)$ is the linear spectral absorption coefficient, (cm^{-1}), including the effects of induced emission, T is the gas temperature, T_R is the "weighting temperature" (equal to the gas temperature, and, optionally, other selected input values), $[\omega_o, \omega_E]$ is the wave number range over which $\mu'_\omega(T)$ is computed, and

$$B_\omega(T_R) = \frac{2hc^2\omega^3}{\exp(hc\omega/kT_R) - 1}$$

is the Planck spectral intensity function with ω the wave number (cm^{-1}),

h the Planck constant (erg-sec), c the speed of light ($cm\text{-}sec^{-1}$), and k the Boltzmann constant ($erg\text{-}^{\circ}K^{-1}$). In the present work, T_R was taken to be equal to the gas temperature only.

The basic input data to the OPSAB program for a particular case are the temperature (°K), the pressure (atm), the spectral range and mixture composition to be considered (the mole fractions of the pertinent species), and the spectroscopic and intensity data for the molecular band systems to be considered. In the present work, the temperatures and pressures are those defined above for the composition calculations, and the spectral range is defined in terms of a dimensionless frequency, u, given by $u = hc\omega/5000k$, with the calculations of the optical constants above for the range limited by u = 2.00 to 19.50, with spectral averaging intervals of width $\Delta u = 0.50$, a total of 35 intervals. We have added an extra interval u = 19.50 - 20.00 to make use of the maximum possible number of 36 averaging intervals, since this improves the accuracy of our calculations for the band systems of diatomic molecules at the highest frequencies. The correspondence of these intervals to wave number intervals (cm^{-1}), is given in Appendix D.

In each spectral averaging interval so defined, the OPSAB program computes the local Planck mean absorption coefficients (cm^{-1}) for the various molecular band systems and absorption processes considered. These are incorporated into sub-total absorption coefficients for the various types of processes, and then these are further incorporated into total local Planck mean absorption coefficients for the case considered; these are then used to compute the Planck and Rosseland mean opacities and the other quantities defined above.

Absorption Mechanisms Considered

The absorption mechanisms considered in the OPSAB computer program calculations of the optical constants for the silicon-hydrogen mixtures of the present work have been limited to those incorporated into this computer program as of the commencement of the present work (listed above). No effort was made to revise this computer program to include additional absorption mechanisms that might have some importance for the conditions considered; the only real significance of this in the present work is the exclusion of processes important only for the cases of pure hydrogen gas (Si/H mass ratios = 0.), which have been considered in more thorough fashion by others (e.g., Ref. 3).

Within this limitation, we have a choice of the electronic band systems of diatomic molecules and of triatomic and polyatomic molecules to be considered in the calculations with the OPSAB computer program. It is believed that all important band systems for which adequate quantitative spectroscopic data exist have been included in the present calculations; some molecular band systems have been included with estimated quantitative spectroscopic data used in lieu of the non-existent laboratory data on account of their expected importance for the optical constants. Also, many oscillator strengths of electronic transitions in molecules have been estimated. We give below listings of the molecular electronic transitions considered in the present work. Table 2 lists the considered transitions in diatomic molecules; Table 3 lists those for triatomic and polyatomic molecules.

The transitions in diatomic molecules are considered in the OPSAB computer program according to the "just-overlapping rotational line" model[9] that is widely used, with an analytic integration scheme, developed by the present author, which yields exactly the local Planck mean absorption coefficients, including the induced emission correction, for each spectral averaging interval specified in the input data. This process will not be described here, since it is given in detail elsewhere[8]. The necessary input data for these calculations are the vibrational and rotational constants of the electronic states involved in the transition, the mole fraction of the molecule involved (all electronic states), the electronic partition function of the molecule, the Franck-Condon factors of all the bands to be considered, and the oscillator strength of the electronic transition. Table 2 lists the transitions in the diatomic molecules which have been considered in the present work. We give here a brief discussion of the sources of the data used:

H_2: The necessary spectroscopic and intensity data are exactly those used in the work of Ref. 1. All molecular constants are taken from Refs. 11 and 12; the intensity data are from Refs. 12 and 13.

SiH: The necessary spectroscopic data are taken from Refs. 14, 15, 16, and 17. Some of the spectroscopic data had to be estimated. The Franck-Condon factors have all been estimated by the method of Ref. 18. For the (A-X) band system

TABLE 2. DIATOMIC MOLECULAR BAND SYSTEMS CONSIDERED

		Print-Out Acronym	Absorption f-value used	Extent of Frank-Condon factor array used
1.	$H_2(B^1\Sigma_u^+ - X^1\Sigma_g^+)$ (Lyman)	H2LYMN	0.30	v'' = 0-14 v' = 0-20
2.	$H_2(B'^1\Sigma_u^+ - X^1\Sigma_g^+)$	H2BP-X	0.055	v'' = 0-14 v' = 0-9
3.	$H_2(C^1\pi_u - X^1\Sigma_g^+)$ (Werner)	H2WERN	0.35	v'' = 0-14 v' = 0-14
4.	$H_2(D^1\pi_u - X^1\Sigma_g^+)$	H2 D-X	0.084	v'' = 0-14 v' = 0-10
5.	$H_2(D'^1\pi_u - X^1\Sigma_g^+)$	H2DP-X	0.030	v'' = 0-20 v' = 0-10
6.	$SiH(A^2\Delta - X^2\pi)$	SIHA-X	0.003	v'' = 0-5 v' = 0-3
7.	$SiH(B^2\Sigma^+ - X^2\pi)$	SIHB-X	0.002 (est.)	v'' = 0-5 v' = 0-3
8.	$SiH(C^2\Sigma^+ - X^2\pi)$	SIHC-X	0.002 (est.)	v'' = 0-5 v' = 0 only
9.	$SiH(D^2\Delta - X^2\pi)$	SIHD-X	0.005 (est.)	v'' = 0-7 v' = 0-7
10.	$SiH(E^2\Sigma^+ - X^2\pi)$	SIHE-X	0.005 (est.)	v'' = 0-5 v' = 0-5
11.	$SiH^+(A^1\pi - X^1\Sigma^+)$	SIH+AX	0.004 (est.)	v'' = 0-15 v' = 0-1
12.	$Si_2(H^3\Sigma_u^- - X^3\Sigma_g^-)$	SI2H-X	0.005 (est.)	v'' = 0-19 v' = 0-23
13.	$Si_2(K^3\Sigma_u^- - X^3\Sigma_g^-)$	SI2K-X	0.006 (est.)	v'' = 0-7 v' = 0-7
14.	$Si_2(N^3\Sigma_u^- - X^3\Sigma_g^-)$	SI2N-X	0.008 (est.)	v'' = 0-7 v' = 0-7

TABLE 3. TRIATOMIC MOLECULAR TRANSITIONS CONSIDERED

Designation	Print-Out Acronym	Absorption f-value used	ω_o - value used (cm^{-1})	ω_e''-value used (cm^{-1})	$\Delta\omega_o$-value used (cm^{-1})
SiH_2 ($\tilde{A}(?)^1B_1$-$\tilde{X}(?)^1A_1$)	SIH2 A	0.001 (est.)	15540	1004	4000
Si_3 ($\tilde{A}(?)^3\Sigma_u^-$-$\tilde{X}(?)^3\Sigma_g^-$)	SI3 A	0.01 (est.)	22500	360	2000

the f-value used is a mean of the results reported in Refs. 19 and 20. For the remaining four band systems the f-values used have been estimated by the present author.

SiH^+: The necessary spectroscopic data are from Ref. 21. The Franck-Condon factors have been estimated by the method of Ref. 18. The f-value used has been estimated by the present author.

Si_2: The necessary spectroscopic data are taken from Refs. 22, 23, and 24. The Franck-Condon factors have been estimated by the method of Ref. 18. The f-values used have been estimated by the present author.

The large proportion of transitions for which essential data had to be estimated indicates that our results will contain uncertainties on this account. The results for the optical constants are particularly sensitive to the set of f-values used. The f-values for strongly-absorbing transitions should ideally be accurately known, but this may not be the case in the present work.

Electronic transitions in triatomic and polyatomic molecules are considered on a simplified model which incorporates an "averaging" over their rotational and vibrational structure, assuming one-dimensional simple-harmonic linear oscillations of the nuclei[8, 10]. The spectral absorption cross section evaluated at the $\bar{\omega}$, the mid-points of the spectral averaging intervals chosen $\sigma'(\bar{\omega}, T)$ (cm^2), including the induced emission correction, for a molecular electronic transition according to the model employed is given by

$$\sigma'(\bar{\omega}, T) = \pi^{1/2} r_o f \left[1 - \exp(-hc\bar{\omega}/kT)\right](\Delta\omega_T)^{-1} \cdot \exp\left[-(\bar{\omega} - \omega_o)^2/(\Delta\omega_T)^2\right] \qquad (1)$$

where r_o is the classical electron radius (cm), f is the oscillator strength of the transition, ω_o is the wave number of the transition absorption maximum (cm^{-1}), and

$$\Delta\omega_T = \Delta\omega_o \left[\tanh(\theta_o/2T)\right]^{1/2} \qquad (2)$$

Here $\Delta\omega_o$ is the 1/e half-width of the spectral absorption cross section function at temperature $T = 0°K$, $\Delta\omega_T$ is this width at temperature $T(°K)$, and $\theta_o = hc\,\omega''_e/k$, with ω''_e the active vibrational frequency (cm^{-1}) of the lower (absorbing) electronic state. The OPSAB program evaluates the functions of Eq. (1) and multiplies these by the number densities of the absorbing states of the species, which are found from the species mole fractions and the energies and statistical weights of the electronic states of the species in the usual fashion. The resulting "spectrally averaged" absorption coefficients for the averaging intervals chosen are not exactly the local Planck mean values, but are negligibly different from them for averaging intervals of width less than a few thousand wave numbers.

We give in Table 3 the values of the necessary parameters used in the present work for the transitions in the SiH_2 and Si_3 molecules, the only triatomic or polyatomic molecules which have been considered. We give here a brief discussion of these data.

SiH_2: The necessary spectroscopic data have been taken from Refs. 25 and 26. The f-value used has been estimated by the present author.

Si_3: The necessary spectroscopic data have been taken from Refs. 7 and 24. The f-value used has been estimated by the present author.

We should remark here that no spectra for SiH_3 or for SiH_4 have been found to date in spite of many years of effort (cf. Refs. 15, 26, and 27). Thus we have not made any effort to include these species in our calculations of the optical constants. Weltner and McLeod[24] have observed bands at 5704 Å from an Si-containing species in frozen inert gas matrices which they believe may be attributed to the Si_4 molecule. This observation yields only very sketchy and uncertain data, and we have not further considered their work in the present calculations (we also have no thermodynamic data for Si_4). They believe also that the transition listed in Table 3 for Si_3 may possibly be actually due to Si_4. Emelius and Stewart[27] have observed continuous absorption below 2000 and 2200 Å, respectively, in Si_2H_6 and Si_3H_8. These possibly are due to photodissociation processes, but we have not attempted to include them in the present work. We have not included Si_3H_8 in our composition calculations. We expect that Si_3H_8 should have very small mole fractions

in the mixtures we have considered, as does Si_2H_6, and our failure to include these transitions should have no serious consequences. Both of these gases were found in Ref. 27 to be transparent at wavelengths larger than the edges of continuous absorption. For H_3^+ we know of no electronic transitions; in view of the very small mole fractions of this species in the mixtures considered, we should not need to give it consideration in the calculations of the optical constants. Concerning other possible polyatomic molecules, e.g., Si_2H, Si_2H_2, or Si_2H_4, absolutely nothing is known of their energy levels, or electronic transitions. Their existence is questionable, and we have no thermodynamic data for such possible species.

The photodetachment absorption processes are considered in the OPSAB program using cross section data and the mole fractions of the ions. These mole fractions may be input to the program, as in the present work, or can be calculated by the program via the Saha equation from the mole fractions of free electrons and of the neutral species. The cross section data compiled into the OPSAB program are tabular data; the OPSAB program interpolates in these tabular data to obtain the values of the cross sections at the mid-points of the spectral averaging intervals chosen. No excited states of the negative ions are considered in the calculation of their ground state number densities from the species mole fractions, but the cross section data used include transitions terminating in excited states of the neutral atoms. The interpolation procedure used does not yield exactly the local Planck mean absorption coefficients for the spectral averaging intervals chosen, but there is little error from this fact in the present work, which includes calculations only for the Si^- and H^- ions. These calculations are described fully in Ref. 8, and they include the induced emission correction. For Si^- we have estimated the photodetachment cross section to be constant at $10^{-17} cm^2$ beyond the absorption edge of 1.46 ev, and otherwise zero.

The free-free absorption processes are considered in the OPSAB program using Kramers' classical formula with unit Gaunt factor[5]. An effective charge factor, Z^2_{eff}, specifies the interaction strengths for free-free transitions in the fields of singly-ionized (either positively or negatively so) species, taken collectively, or in the fields of neutral species, taken collectively. In the former case we use $Z^2_{eff} = 1$, and in the latter case we use $Z^2_{eff} = 0.02$, a reasonable average value[1]. Kramers' formula is evaluated at the mid-points of the spectral averaging intervals chosen, using the

mole fractions for the (collective) singly-ionic species and for the (collective) neutral species, which are input to the OPSAB program. This yields the values of the spectral absorption coefficients (cm^{-1}) for these two processes at the interval mid-points, which should be negligibly different from the local Planck mean values for the present work; the calculated values include the induced emission correction.

The radiative association process for hydrogen atoms defined above has been known for many years. This process is considered in the OPSAB program using the model described in Ref. 1. The scheme of the OPSAB calculations is given in Refs. 8 and 10, but we note here that we simply evaluate the formula (adding to it the induced emission correction) for the spectral absorption coefficient (cm^{-1}) due to this process, incorporating the H atom number density found from the H atom mole fractions given by the HUG program composition calculations, at the mid-points of the spectral averaging intervals chosen. These differ little from the local Planck mean values for the present application.

Analogous radiative association processes should not be important for the other molecules present in the mixtures considered, and, in fact, nothing is known of these if they exist. However, photodissociation processes from the ground states of some of the molecules present have been studied in the literature, and their importance will be discussed below when the accuracy of the calculations of the optical constants is assessed.

Calculations of photoionization absorption for neutral Si and H atoms have been included in the present work. We note here that these calculations use photoionization cross sections from the literature[28, 29], interpolated at the mid-points of the spectral averaging intervals chosen, and the number densities of neutral Si and H atoms found from their mole fractions given by the HUG composition program, and that these calculations now include the induced emission correction to the computed spectral absorption coefficients, which was not the case for the work of Ref. 1. These calculations are as described in Appendix E of Ref. 1, except for the addition of the Si process and cross section data to the program, and for the addition of the correction factor for induced emission.

The OPSAB program sums over these processes to find the spectral absorption coefficients of the gas mixtures. These results are used to calculate the opacities and radiative emission parameters. For further details of the quantities computed, the reader is referred to Ref. 8. A discussion of the accuracy of our results for the optical constants is given in the section following the discussion of results.

Discussion of Results

The major results of the calculations of the optical constants for the silicon-hydrogen mixtures considered are given in Appendix D to this report; the complete results of these calculations, which include the contributions to the local Planck mean absorption coefficients of each of the molecular band systems and absorption processes considered, have not been given here due to their great length (c. 800 pages). Table 4 presents the opacity results.

We give in Figs. 2a - 2h hand-plots of the Planck and Rosseland mean opacities vs. gas temperature for the three pressures and four Si/H mass ratios considered. These and Table 4 show the marked variation of these quantities with the gas temperature, and the quite large values ($\sim 5. \text{cm}^{-1}$)which they achieve at the highest temperatures and pressures considered. These quantities vary approximately in proportion to the gas pressure and Si/H mass ratio. We note here that the dip in the curves for the case with Si/H mass ratio = 0.005 and P = 1000 atm. at T = 5000° K (cf. Fig. 2b and Fig. 2f) is due to the fact that for this case the HUG program was not able to iterate to obtain the free electron concentrations, which it was able to do for P = 100 and 500 atm, and this temperature and Si/H mass ratio. Thus, the free-free and photodetachment processes could not be computed for this case, and the opacity results obtained for it are artifically low. In Fig. 3 we give a plot of the local Planck mean (spectral) absorption coefficients vs. wavenumber and dimensionless frequency, u, for a gas pressure of 1000 atm., Si/H mass ratio of 0.05 and gas temperatures of 1600, 3000, 6500, and 10,000° K. Our results are similar for the remaining gas pressures and Si/H mass ratios.

We must point out that our calculations have been done for fixed values of the gas pressure, so that for each fixed pressure there is a decline as 1/T in total particle number density in the gas mixtures with increasing gas temperature, T. Thus, for T = 10,000° K, this particle density is only about 1/6 of that at T = 1600° for the

TABLE 4. PLANCK AND ROSSELAND MEAN OPACITIES FOR SILICON-HYDROGEN MIXTURES.

MEAN OPACITIES TO THREE FIGURES (CM^{-1})

Si/H Mass Ratio:	0.0			0.005			0.01			0.05		
Gas Press. (atm.) / Gas Temp. (°K)	100	500	1000	100	500	1000	100	500	1000	100	500	1000
1600	1.74-25	8.69-25	1.74-25	3.35-04	7.05-04	9.38-04	6.69-04	1.41-03	1.87-03	1.37-03	6.84-03	9.41-03
	7.98-39	3.99-38	7.98-38	2.92-04	6.16-04	8.19-04	5.84-04	1.23-03	1.64-03	1.20-03	5.98-03	8.22-03
2200	7.28-17	3.64-16	7.29-16	1.68-03	4.73-03	7.02-03	3.36-03	9.45-03	1.40-02	1.68-02	4.74-02	7.03-02
	3.96-27	1.98-26	3.96-26	1.44-03	4.04-03	5.98-03	2.88-03	8.06-03	1.19-02	1.44-02	4.04-02	5.99-02
3000	7.31-11	3.69-10	7.39-10	2.34-03	9.37-03	1.58-02	4.68-03	1.87-02	3.16-02	2.34-02	9.38-02	1.58-01
	8.53-19	4.30-18	8.62-18	1.49-03	5.89-03	9.94-03	4.39-03	1.14-02	1.92-02	1.45-02	5.56-02	9.24-02
4000	6.79-07	3.71-06	7.57-06	8.63-04	7.63-03	1.55-02	1.72-03	1.52-02	3.10-02	8.59-03	7.61-02	1.55-01
	1.79-12	6.10-12	1.06-11	5.57-04	4.65-03	9.43-03	1.03-03	8.57-03	1.74-02	4.30-03	3.51-02	7.08-02
5000	8.72-05	6.16-04	1.34-03	2.05-03	1.41-02	1.00-02	2.96-03	2.11-02	4.57-02	7.37-03	6.35-02	1.47-01
	7.18-09	2.50-08	4.26-08	1.77-03	1.19-02	6.85-03	2.57-03	1.78-02	3.75-02	6.33-03	5.15-02	1.15-01
6500	6.52-03	6.91-02	1.82-01	1.13-02	1.11-01	2.73-01	1.47-02	1.40-01	3.36-01	3.09-02	2.77-01	6.46-01
	4.11-03	3.84-02	1.00-01	8.17-03	7.49-02	1.79-01	1.09-02	9.90-02	2.32-01	2.36-02	2.10-01	4.85-01
8000	2.88-02	3.57-01	1.02+00	3.29-02	4.04-01	1.14+00	3.68-02	4.47-01	1.25+00	6.47-02	7.13-01	1.91+00
	2.07-02	2.15-01	5.67-01	2.37-02	2.54-01	6.73-01	2.66-02	2.89-01	7.65-01	4.58-02	4.93-01	1.29+00
10000	8.87-02	1.08+00	3.23+00	9.23-02	1.12+00	3.33+00	9.61-02	1.16+00	3.44+00	1.28-01	1.47+00	4.23+00
	7.46-02	8.17-01	2.27+00	7.69-02	8.45-01	2.35+00	7.92-02	8.72-01	2.43+00	9.77-02	1.08+00	3.01+00

NOTE: 1.74-25 is used to represent 1.74×10^{-25}, etc. For each entry, the upper value given is the Planck mean absorption coefficient (cm^{-1}), and the lower value is the Rosseland mean absorption coefficient (cm^{-1}). Underlined values are for cases where solid silicon was found to be present.

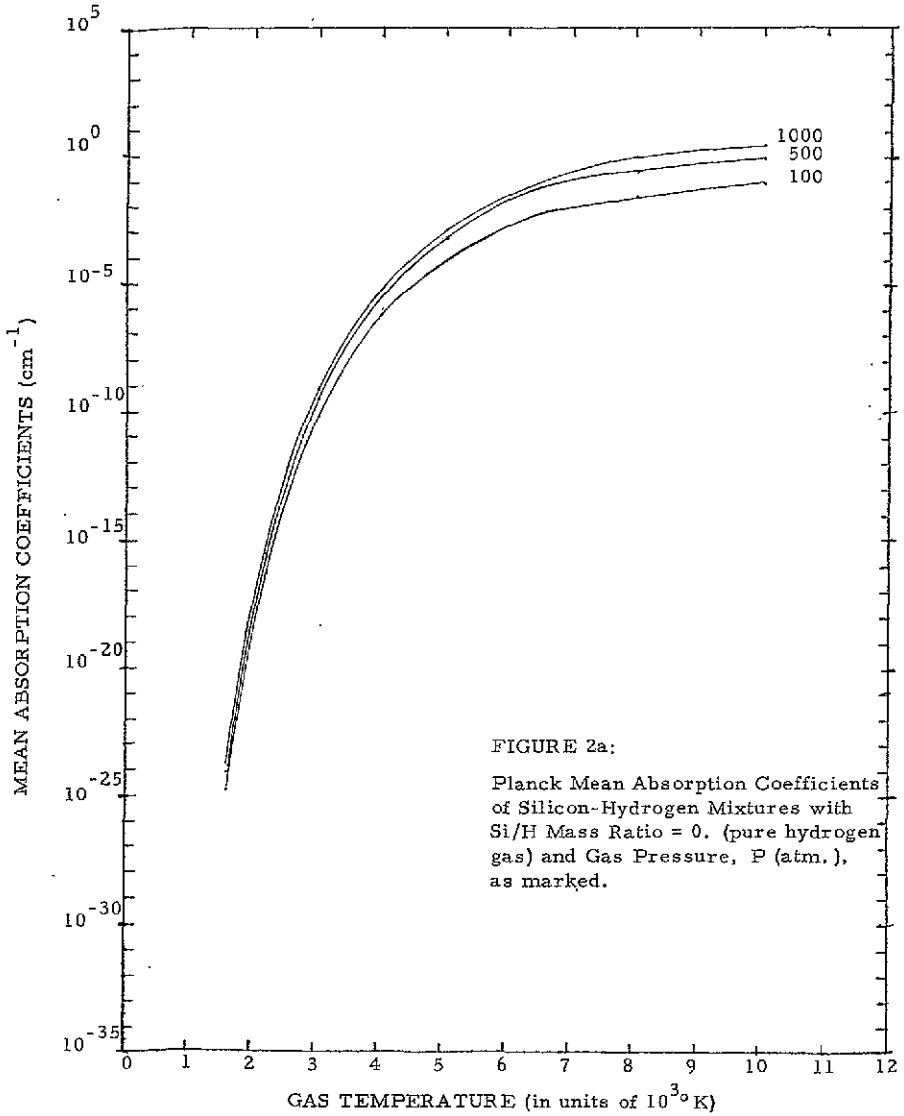

FIGURE 2a:

Planck Mean Absorption Coefficients of Silicon-Hydrogen Mixtures with Si/H Mass Ratio = 0. (pure hydrogen gas) and Gas Pressure, P (atm.), as marked.

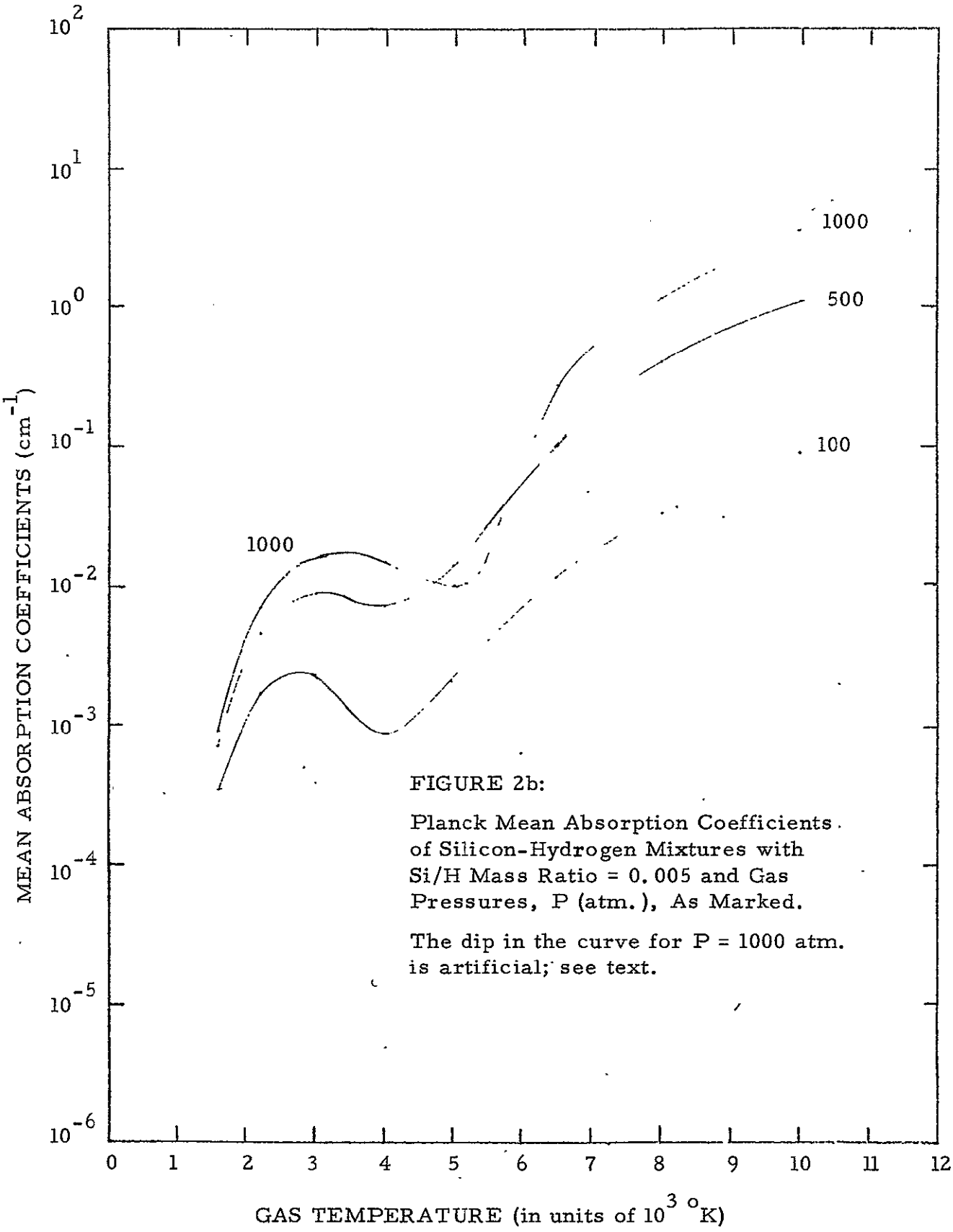

FIGURE 2b:

Planck Mean Absorption Coefficients of Silicon-Hydrogen Mixtures with Si/H Mass Ratio = 0.005 and Gas Pressures, P (atm.), As Marked.

The dip in the curve for P = 1000 atm. is artificial; see text.

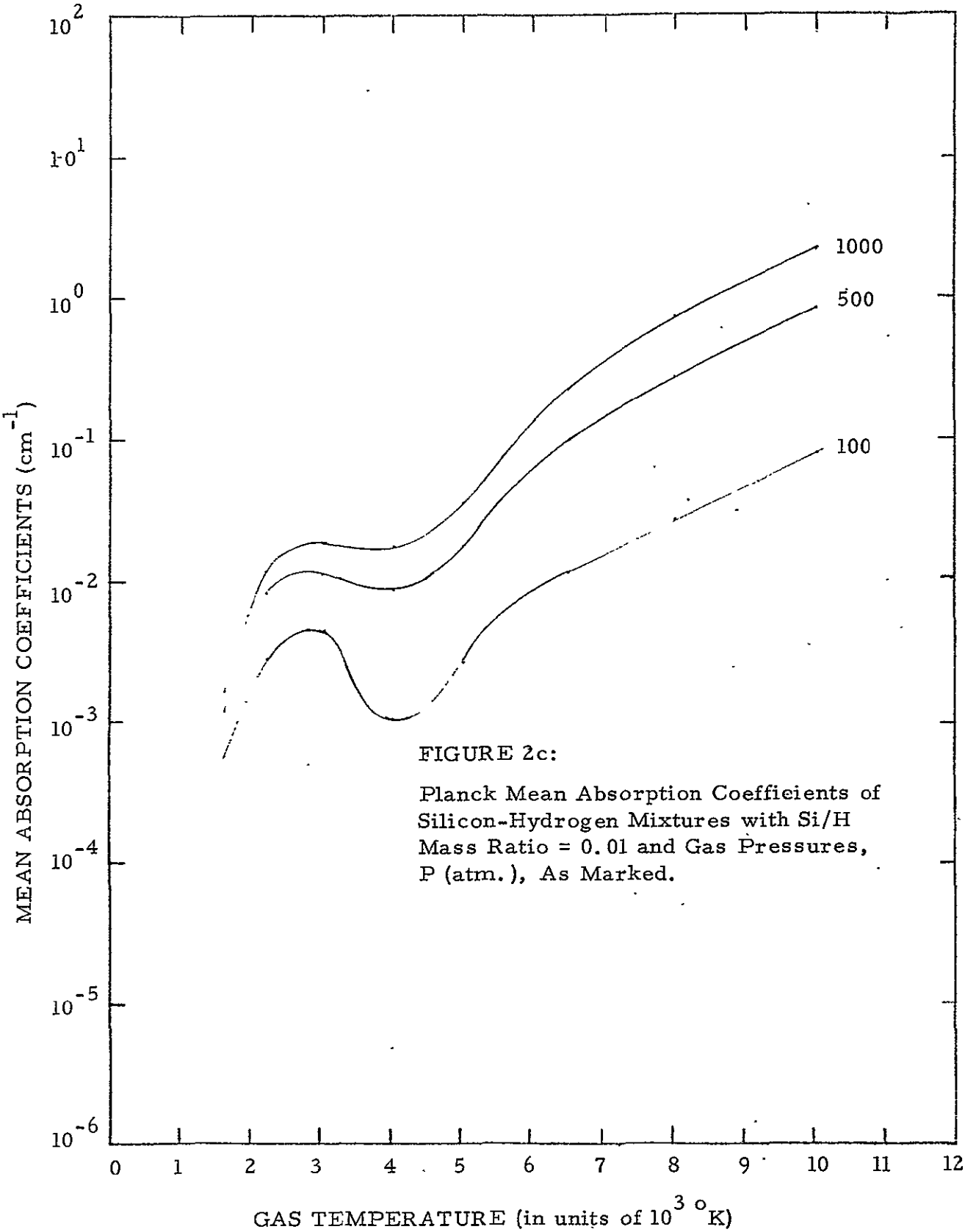

FIGURE 2c:

Planck Mean Absorption Coeffieients of Silicon-Hydrogen Mixtures with Si/H Mass Ratio = 0.01 and Gas Pressures, P (atm.), As Marked.

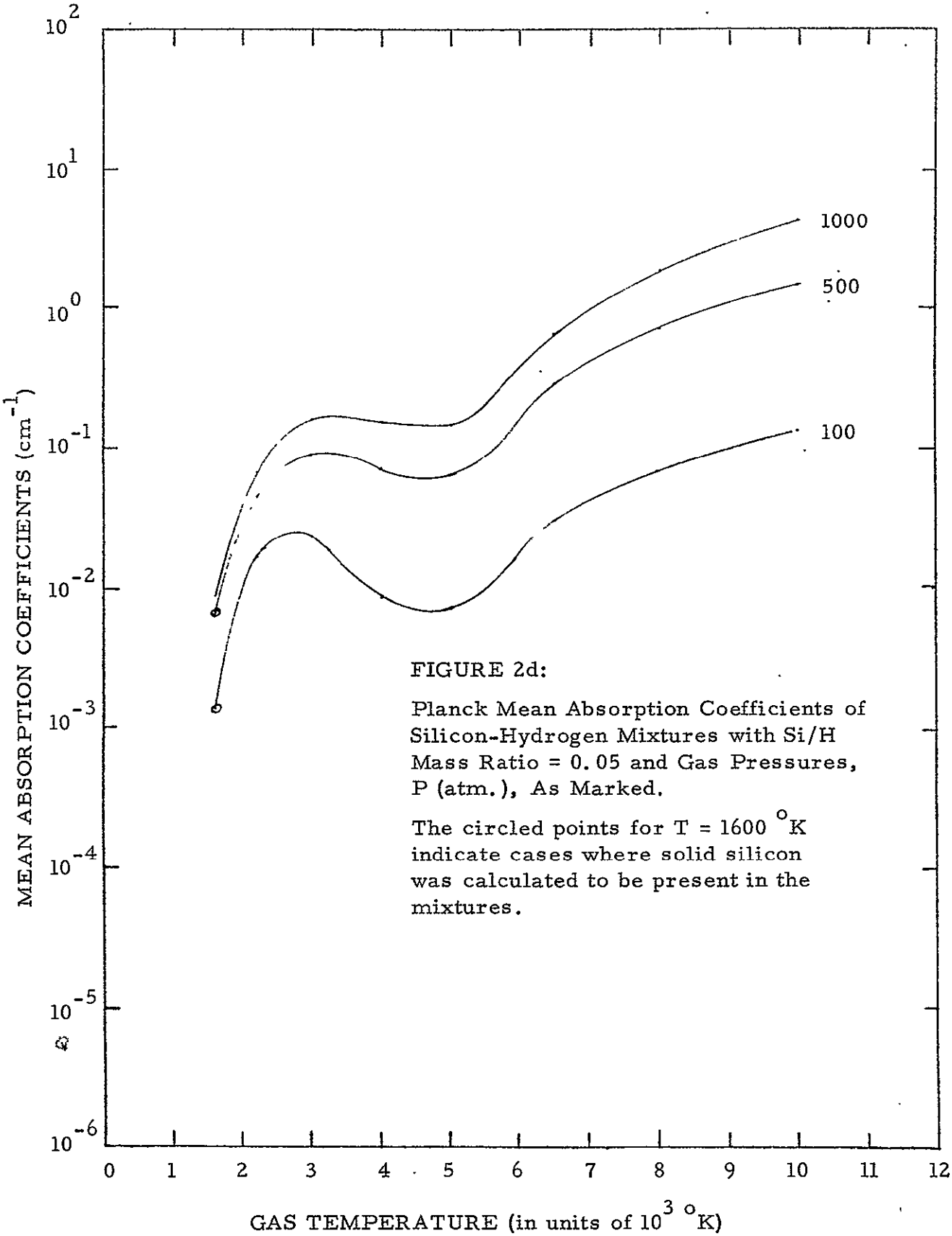

FIGURE 2d:

Planck Mean Absorption Coefficients of Silicon-Hydrogen Mixtures with Si/H Mass Ratio = 0.05 and Gas Pressures, P (atm.), As Marked.

The circled points for T = 1600 °K indicate cases where solid silicon was calculated to be present in the mixtures.

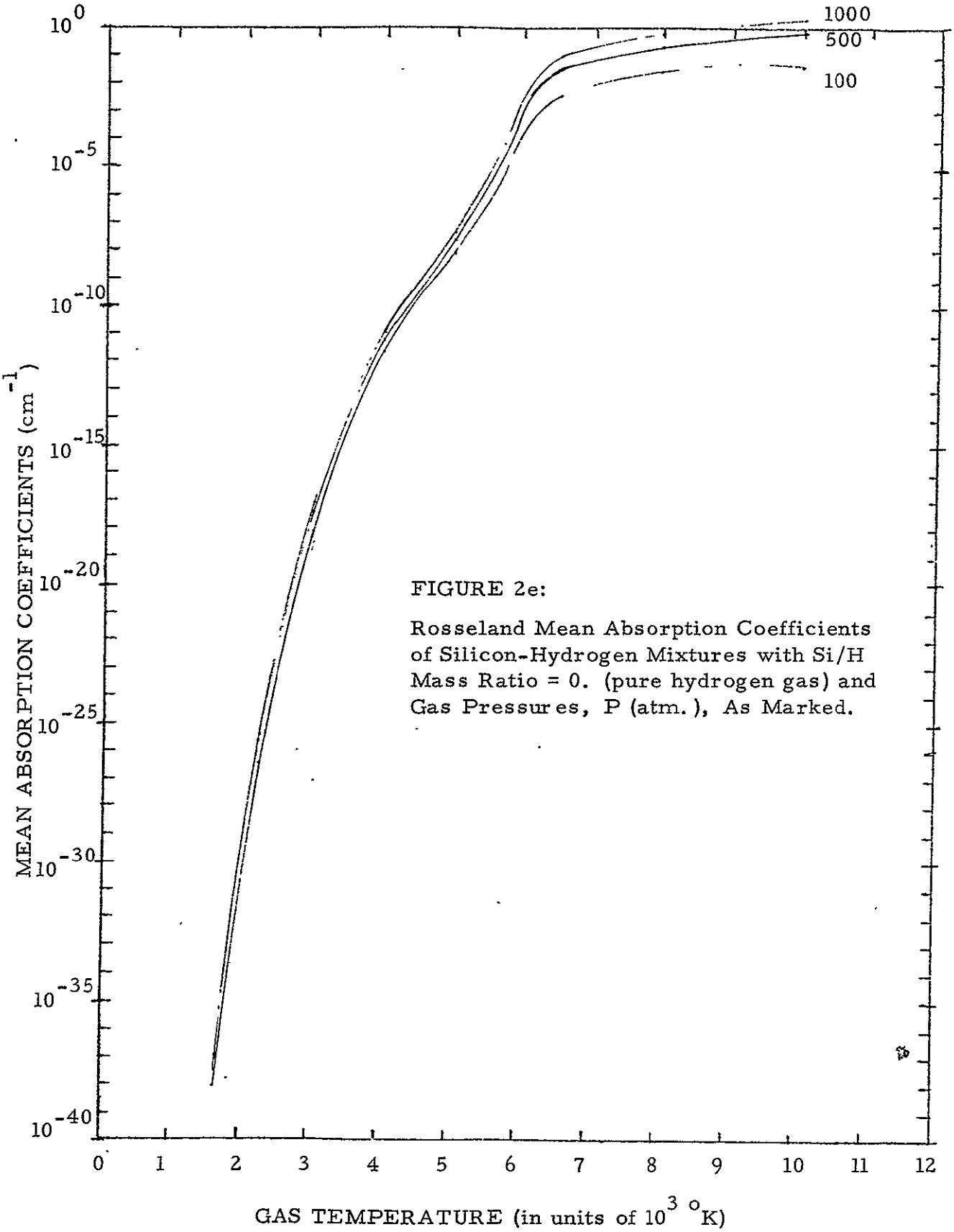

FIGURE 2e:

Rosseland Mean Absorption Coefficients of Silicon-Hydrogen Mixtures with Si/H Mass Ratio = 0. (pure hydrogen gas) and Gas Pressures, P (atm.), As Marked.

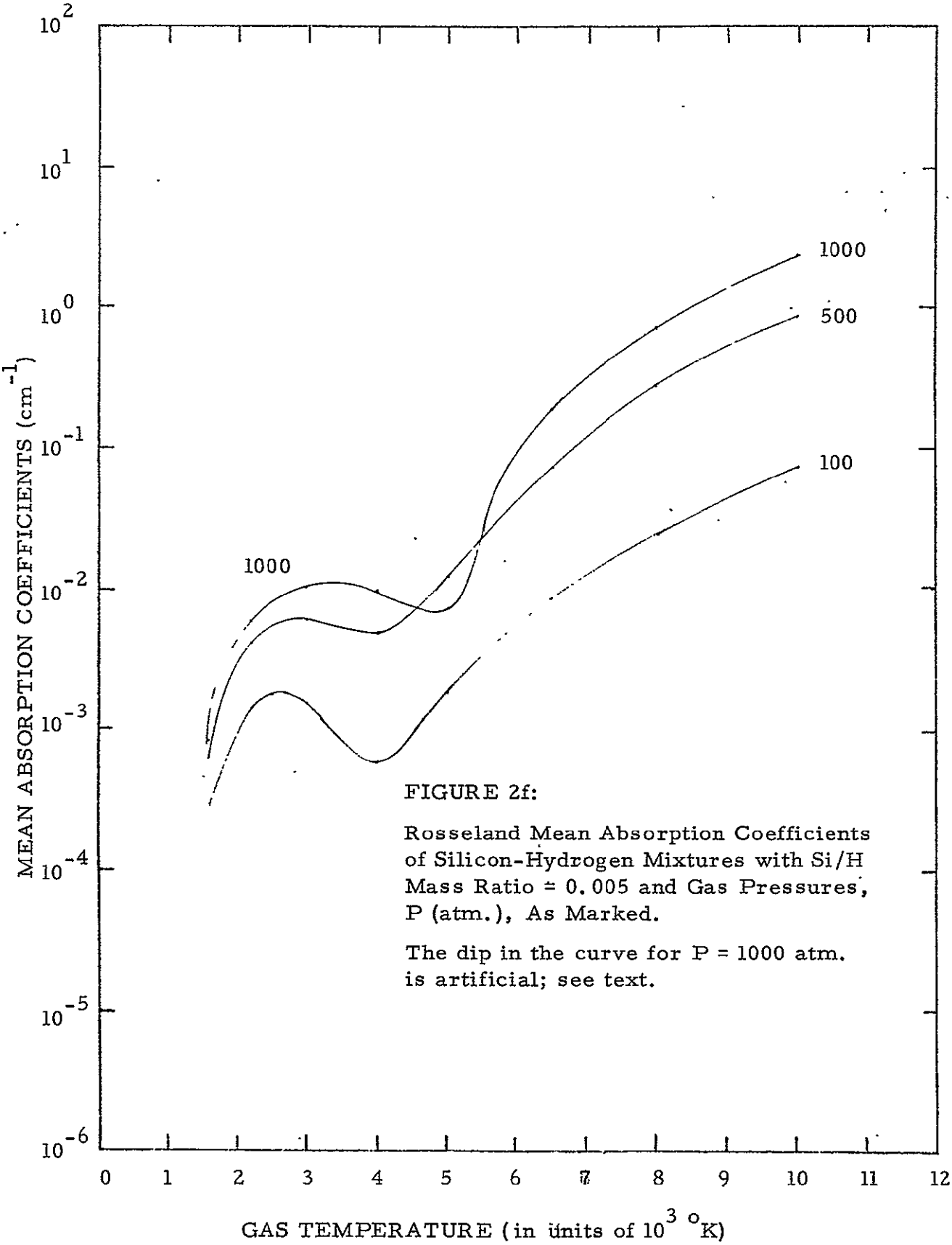

FIGURE 2f:

Rosseland Mean Absorption Coefficients of Silicon-Hydrogen Mixtures with Si/H Mass Ratio = 0.005 and Gas Pressures, P (atm.), As Marked.

The dip in the curve for P = 1000 atm. is artificial; see text.

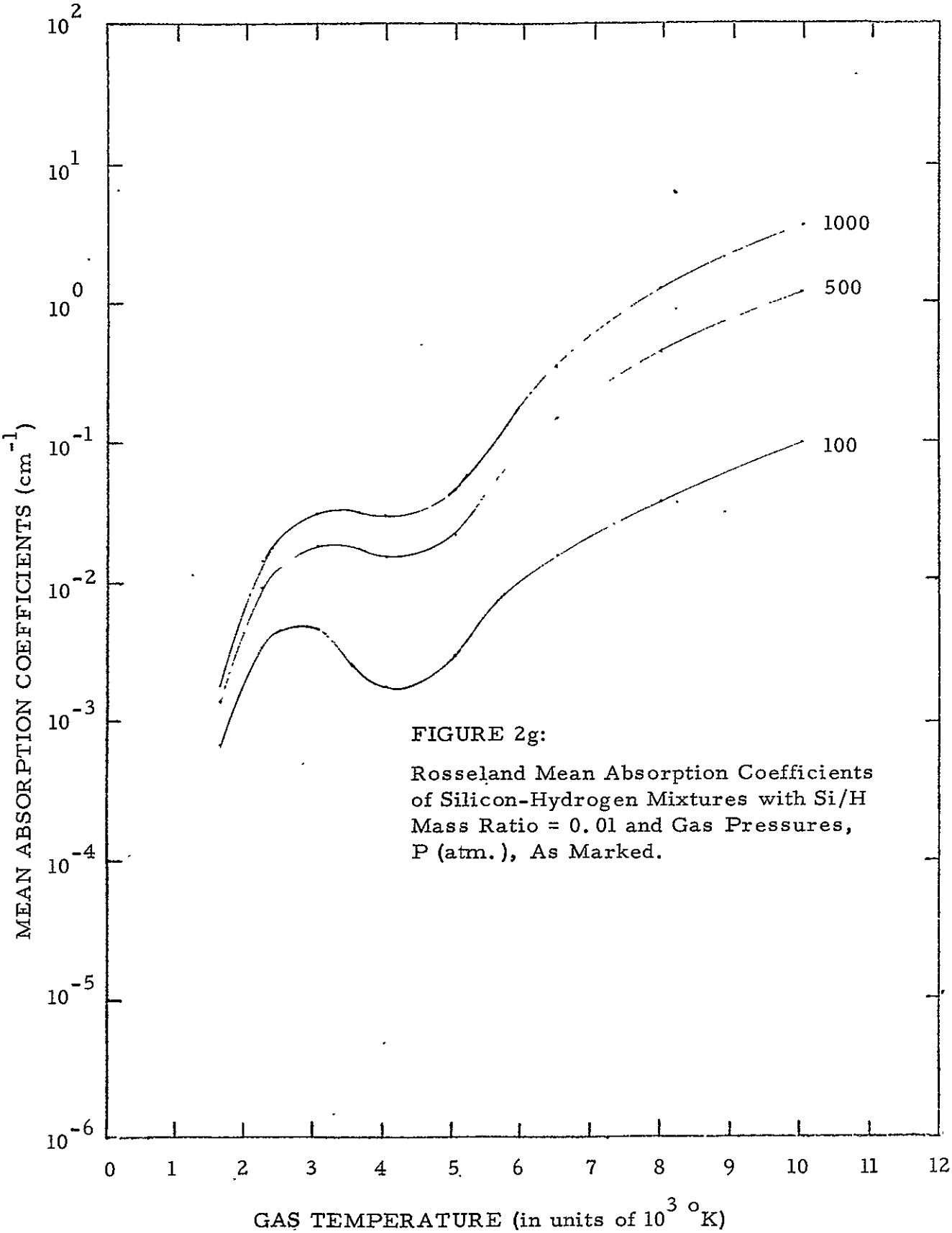

FIGURE 2g:

Rosseland Mean Absorption Coefficients of Silicon-Hydrogen Mixtures with Si/H Mass Ratio = 0.01 and Gas Pressures, P (atm.), As Marked.

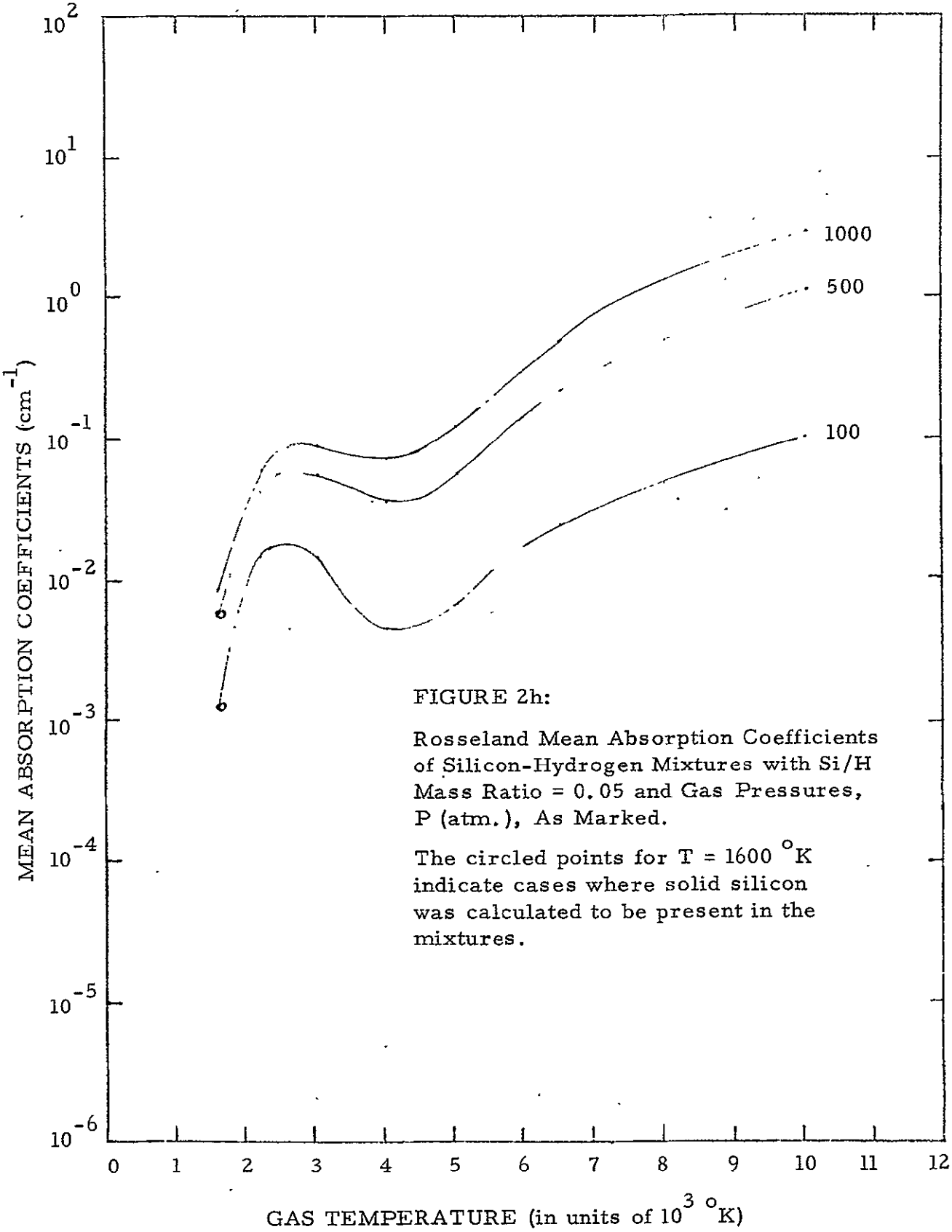

FIGURE 2h:

Rosseland Mean Absorption Coefficients of Silicon-Hydrogen Mixtures with Si/H Mass Ratio = 0.05 and Gas Pressures, P (atm.), As Marked.

The circled points for T = 1600 °K indicate cases where solid silicon was calculated to be present in the mixtures.

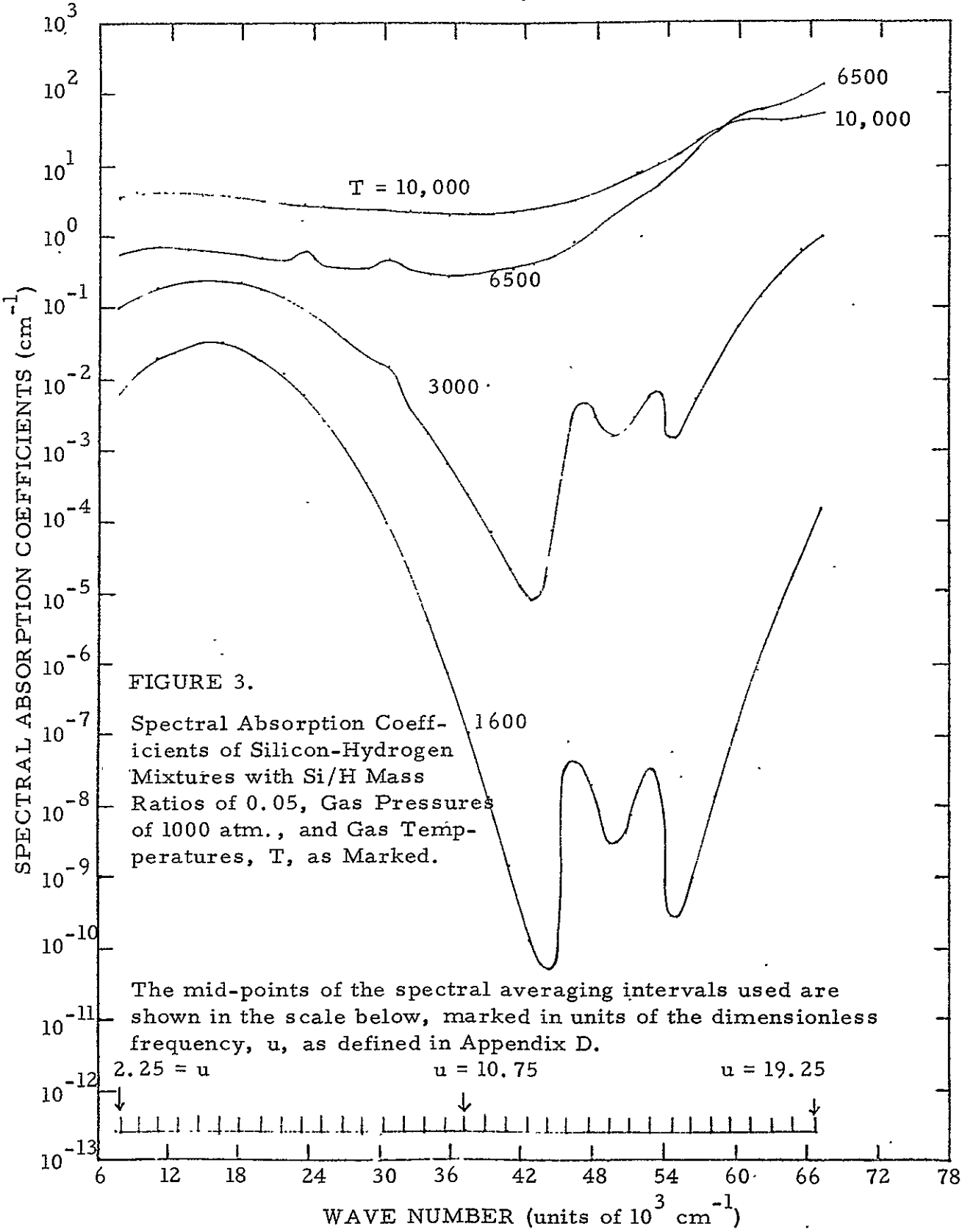

FIGURE 3.

Spectral Absorption Coefficients of Silicon-Hydrogen Mixtures with Si/H Mass Ratios of 0.05, Gas Pressures of 1000 atm., and Gas Temperatures, T, as Marked.

same gas pressure. We readily see from Figs. 2a - 2h and from Fig. 3, that the cross sections for the important absorbing processes behave so as to more than counterbalance this effect. The general increases in optical absorption with increasing gas temperature are due, in a rough sense, to the increases with temperature of the cross sections for the important absorbing processes, and to the appearance of new important absorption processes with large cross sections, e.g., the H^- photodetachment, Si photoionization, and neutral free-free processes, at the higher gas temperatures.

Note that large local Planck mean absorption coefficients at all wave numbers are found only at the highest gas temperatures considered (Fig. 3, this holds true for the remaining gas pressures and Si/H mass ratios considered). This is of importance when the energy source whose radiation is to be absorbed by the gas mixture envisioned has a very broad, and nearly uniform, spectrum. Also note (Fig. 3, and true for the remaining gas pressures and Si/H mass ratios considered) that it is nearly true that at each wave number the local Planck mean absorption coefficient increases monotonically with the gas temperature; this is another significant fact. The behavior of the local Planck mean absorption coefficient with gas pressure and Si/H mass ratio is approximately what one would expect - it increases approximately in proportion to them. The most important absorbing mechanisms are listed in Table 5.

We can compare the present results with those reported for carbon-hydrogen mixtures in Ref. 1. The most notable fact is that the absorption coefficients for the silicon-hydrogen mixtures are often larger, at the lowest temperatures and smaller wave numbers, much larger, than those for the carbon-hydrogen mixtures. This is in spite of the fact that for identical mass ratios the silicon-hydrogen mixtures contain only about half the number densities of silicon-containing species as the number densities of carbon-containing species in the carbon-hydrogen mixtures for the same conditions, and is due largely to the strong presence of SiH and SiH_2 and to the strong Si photoionization continuum. This indicates that a gaseous core nuclear propulsion system utilizing a mixture of Si and C for the seed material might ultimately produce the most desirable absorber, viz., a grey gas.

In general, we find that the silicon-hydrogen mixtures may be more suitable as propellant gases for gaseous-core nuclear rockets; this would be particularly true if solid (or liquid) silicon is present at the lower temperatures. However, we must note that there are many more uncertainties in the present work than was the case for

TABLE 5

IMPORTANT PROCESSES CONTRIBUTING TO THE ABSORPTION COEFFICIENTS AND OPACITIES

Gas Temperature Ranges:	Low (1600-3000°K)	Middle (4000-5000°K)	High (6500-10,000°K)
Si/H Mass Ratio = 0. (pure hydrogen gas)	H_2 Lyman bands H+H radiative association	H_2 Lyman bands H+H radiative association H photoionization H^- photodetachment	H_2 Lyman bands H+H radiative association H photoionization H^- photodetachment Neutral free-free
Si/H Mass Ratio = 0.005, 0.01, and 0.05	H_2 Lyman bands SiH bands SiH_2 bands	H_2 Lyman bands H+H radiative association H^- photodetachment SiH bands SiH_2 bands Si photoionization	H_2 Lyman bands H^- photodetachment Si photoionization Neutral free-free

Note: Not all of the absorption processes were considered for the low and middle temperature ranges. Thus, this listing may be somewhat incomplete for these temperature ranges. In addition, the computer calculations for hydrogen gas (Si/H mass ratio = 0.) did not include several important absorption processes, e.g., the H_2 pressure-induced absorption. The ordering in the above listing has no significance.

the carbon-hydrogen mixtures in Ref. 1. Thus we recommend that the present results be used cautiously, particularly for the cases with lower temperatures.

Uncertainties in the Calculations of the Optical Constants

Uncertainties in the calculations of the optical constants are partly due to the uncertainties in the composition calculations, which have already been discussed. They are also partly due to our choice of absorption mechanisms considered and of the data used in the computer calculations.

Photodetachment from molecular negative ions (probably resulting in dissociation of the molecule), may be of some importance. We have considered photodetachment only from Si^- and H^- ions, and we have calculated the mole fractions for these ions only. Molecular negative ions have been conjectured to be of importance in radiation transport in the atmospheres of cool stars, and such may also be true here. So little is known of molecular negative ions that we are unable to infer whether this may be true. Much further experimentation with these species is necessary before these processes can be accurately included in calculations of the present type. We estimate that they can be of somewhat greater importance than photodetachment from atomic negative ions for some conditions, and this means that they could possibly be a major factor in determining the optical constants of the mixtures considered here.

Photoionization processes of molecules have not been considered here, but it appears possible from study of our results for the photoionization of the Si and H atoms that such processes may be of significance in determining the optical constants of the mixtures we have considered. Due to the relatively large cross sections of some photoionization processes (as large as 10^{-16} cm^2 near threshold), this seems probable. McGuire[31] has given an apparently valid method for estimating the photoionization cross sections of the ground states of molecules. He finds that the cross section for a molecule is the sum of the cross sections for its constituent atoms, and one would expect, and, in fact, does find that molecules have generally larger photoionization cross sections than do atoms.

Photodissociation processes of molecules might also be of some significance. Theoretical and experimental photodissociation

cross sections for H_2 and H_2^+ have been reported in the literature, but none are known for the other molecules of interest here. Photodissociation thresholds for the molecules of interest will probably fall in such spectral ranges that the continuous absorption resulting from them, and extending to larger wave numbers, can be important in the sense that the sum total of these process for all molecules existing in the mixtures we have considered may be of approximately the same strength as, or stronger than, some of the important non-dissociating molecular transitions. The very strong photodissociation continuum of the O_2 molecules shows how significant such processes can be, but for the cases of interest here the importance of molecular photodissociation processes must be regarded as questionable pending experimental studies at the temperatures of interest.

An omission from the present work is the pressure-induced infrared (vibration-rotation) absorption of H_2. Calculation of the spectral absorption coefficients due to this process by Patch [3] show the importance of this process in pure hydrogen gas. For a gas temperature of 1600° K, the spectral absorption coefficient due to the H_2 pressure-induced transitions is about 10^{-8} P^2 (cm^{-1}) at a wavenumber of 7000 cm^{-1}, with P the gas pressure in atmospheres, declining to larger wave numbers. The H_2 pressure-induced absorption is found to be relatively unimportant here, except for the reference cases of pure hydrogen gas, which is in contrast to the case for carbon-hydrogen mixtures (Ref. 1). In silicon-hydrogen mixtures the H_2 pressure-induced absorption is outweighed by the strong SiH_2 absorption for all cases considered.

We may question our choice of molecular electronic transitions considered in the calculations of the optical constants, the oscillator strengths we have chosen for them (Tables 2 and 3), and the model we have used to represent their spectral absorption coefficients. We have included here all of the known transitions we believe to be of importance, and very little better can be done. Many of our oscillator strengths and much of our molecular data have been estimated. For example, SiH_2 is an important contributor to the optical constants for a fairly wide range within the conditions considered, and the oscillator strength for its transition had to be estimated by the present author. It is difficult to quantitatively assess the errors arising from these estimations; however, the errors may tend to

cancel out. Where one or very few molecules only are strong contributors to the absorption, as here, this effect may not occur, so that errors in the estimated quantities may have great significance (an order of magnitude and more) for the optical constants.

The models we have used to represent absorption by molecular electronic transitions have been chosen largely because their simplicity makes them suitable for calculations of the present type where many such transitions must be considered. To be sure, these models are inaccurate, and in cases where only one or a few molecules are very strong contributors to the computed optical constants these models must be examined critically. Since there is no real quantitative data on the high temperature absorption of the molecules considered here, it is nearly impossible to say with certainty how good or poor these models are. More accurate line-by-line calculations of molecular absorption, which use assumed line shapes, show that these models may truly represent high temperature molecular absorption to within a factor of 2 or 3 [32]. We are at a loss to say more than this, but we note that in optically thick gases even the line-by-line calculations are subject to errors due to the assumption of line shapes and to simplifications generally necessary in such involved studies.

We note briefly here that we have neglected collective absorption effects and atomic line absorption. Neither of these types of processes should be of importance here. We have noted in our discussion of the errors in the similar composition calculations of Ref. 1 that our assumption of the ideal gas equation of state can lead to errors in the calculations of the optical constants for the conditions considered of as much as about 20. per cent in the most severe cases. Also, any error in the composition calculations will be carried into the calculations of the optical constants. In optically thin gases the errors in the calculated optical constants will be proportional to the errors in the computed compositions, but in optically thick gases this dependency is reduced to an approximate proportionality to the square root of the errors in the composition calculations. These errors are probably not serious here in view of the possibly still more serious errors in the computed optical constants from other sources. We note finally that we have no comparison with other theoretical or experimental work on the silicon-hydrogen mixtures we have considered. This places us at a disadvantage in assessing the accuracy of our work.

To summarize our semi-quantitative error assessments, we

can state as follows: For gas temperatures of less than about 3000° K our results for the optical constants are possibly in error due to our inability to adequately consider the three-phase equilibrium of the silicon-hydrogen mixtures and thus to accurately compute the compositions of the mixtures. At the highest gas temperatures considered (8000° K and 10,000° K), our results are probably correct to within a factor of 2 or 3, since here the better-known continuous absorption processes and H_2 Lyman band system provide much of the absorption. For intermediate gas temperatures our most significant errors may be those of omission, and our results may be lower limits to the true optical constants. We cannot say this with certainty, however, since estimated molecular absorption could also cause our results to be overly large. It is safe to say that a better error assessment than this should only be based on a detailed comparison of our results with good quantitative experimental data for the same mixtures or for species contained in them at gas temperatures and pressures in the ranges we have considered. The accuracy of the present work must be taken into account in any engineering and design calculations which make use of it; the present results, as presented in Appendix D to this report, must be accepted as true only with the qualifications mentioned. In particular, an accurate comparison with the results for carbon-hydrogen mixtures reported in Ref. 1 cannot be made, since the many more uncertainties and possible important omissions in the present work preclude this. It seems, however, that with uncertainties and omissions eliminated the silicon-hydrogen mixtures may be more strongly absorbing than the corresponding carbon-hydrogen mixtures.

CONCLUSIONS

In this work we have presented calculations of the species compositions and optical constants of silicon-hydrogen gas mixtures for a wide range of conditions of gas temperature and for different gas pressures and Si/H mass ratios. We have found that for temperatures of about 6500° K and above the spectral absorption coefficients and Planck-and Rosseland mean opacities become quite large, attaining values of several reciprocal centimeters and more. For temperatures less than about 6500° K the mentioned optical constants of the gas mixtures considered are relatively small and tend to decrease toward lower gas temperatures. For the highest gas temperatures our results are surely most accurate, probably sufficiently accurate for most engineering studies, and it seems that this regime will probably be the most interesting for engineering study. It is clear that much further work will be necessary to improve the accuracy of our results at the lower and intermediate temperatures. Much more experimental study in this area is desirable. In particular, a thorough experimental study of the three-phase equilibrium of the Si-H system at temperatures up to about 4000° K is required in order to assess the possible importance of condensed solid or liquid silicon for the optical constants of the mixtures considered. The available data are insufficient for a theoretical study at the present time. Additionally, oscillator strength data for electronic transitions in important molecules is almost totally lacking. We have given cautions regarding use of these results in engineering radiative heat transfer studies. With these cautions taken into account, the present results should furnish the basis for reasonably informative radiative heat transfer studies relating to the design of gaseous-core nuclear rocket propulsion systems, since the major uncertainties affecting the present work occur only in the low temperature regime.

ACKNOWLEDGEMENT

Further work in the design of gaseous-core nuclear rocket propulsion systems may well benefit from the suggestion by Dr. Richard W. Patch, NASA-LRC, that an essentially grey absorbing gas can be produced by seeding the high temperature hydrogen working fluid with a mixture of Si and C atoms.

APPENDIX A

THERMODYNAMIC FUNCTIONS FOR THE SiH^+ AND Si^- IONS

No thermodynamic functions for the SiH^+ or Si^- ions were found after a search of the literature; since it was expected that these species would be important for the calculations of the optical constants at the higher temperatures considered here, these were hand calculated by the present author, as described below.

SiH^+

The basic molecular data were taken from Ref. 21. The data actually used in the approximate hand calculations were:

Mass: M = 29.093 a.u.

Ground state: $X\,^1\Sigma^+$ ($g_0 = 1$; $\epsilon_0 = 0.$)

Symmetry number: 1

Spectroscopic constants: $\omega_e = 2151.10\ cm^{-1}$

$\omega_e x_e = 34.21\ cm^{-1}$

$B_e = 7.6603\ cm^{-1}$

$\alpha_e = 0.2096\ cm^{-1}$

Excited states: $A\,^1\pi$ ($g_1 = 2$; $\epsilon_1 = 25025.20\ cm^{-1}$)

$a\,^3\pi$ ($g_2 = 6$; $\epsilon_2 = 8000\ cm^{-1}$; estimated by analogy to CH^+; cf. Appendix A to Ref. 1.)

The expressions used for the approximate thermodynamic functions were (Ref. 7, p. 24):

$$\frac{H_T^o - H_0^o}{T} = 6.95541 + 1.98726 \left\{ \frac{u e^{-u}}{1-e^{-u}} \right\}$$

$$+ \frac{2.859349}{T} \left\{ \frac{\sum_{i=0}^{2} \epsilon_i g_i e^{-1.43879\epsilon_i/T}}{\sum_{i=0}^{2} g_i e^{-1.43879\epsilon_i/T}} \right\}$$

$$\frac{-(F_T^o - H_0^o)}{T} = 6.863753 \log_{10} M + 11.439588 \log_{10} T$$
$$- 8.006779 - 4.575835 \log_{10} (B/T)$$
$$- 4.575835 \log_{10} (1-e^{-u})$$
$$+ 4.575835 \log_{10} \left[\sum_{i=0}^{2} g_i e^{-1.43879\epsilon_i/T} \right]$$

where T is the temperature (^oK), $u = (1.43879/T)(\omega_e - 2\omega_e x_e)$, $B = B_e - (\alpha_e/2)$, and the remaining quantities are given above. In this way, we obtain the following results (in units of cal-$^oK^{-1}$-mole^{-1}):

SiH^+ Thermodynamic Functions

$T(^oK)$	$(H_T^o - H_0^o)/T$	$-(F_T^o - H_0^o)/T$
1000	7.262	43.41
2000	8.019	49.49
3000	8.980	52.86
4000	9.742	55.57
5000	10.118	57.76
6000	10.310	59.62
7000	10.374	61.19
8000	10.344	62.63
9000	10.288	63.80
10,000	10.265	64.94

The value for ΔH_f ($T = 0^\circ K$) of SiH^+ was found using the JANAF value[7] of this quantity for SiH, 83.3 kcal/mole, and an ionization energy for SiH of 8.01 ev (184.71 kcal/mole)[21]. We find ΔH_f ($T = 0^\circ K$) for SiH^+ to be 268.01 kcal/mole. The above values have been used in the composition calculations of the present work.

Si^-

The spectroscopic data were taken from Ref. 30. Si^- should have no stable excited states, which greatly simplifies the hand calculation of the thermodynamic functions. The actual data used in the calculation were:

Mass: M = 28.086 a.u.

Ground state: $^4S^\circ_{3/2}$ ($g_0 = 4$; $\epsilon_0 = 0.$)

Excited states: None

The expressions for the thermodynamic functions (Ref. 7, p. 24) simplify to:

$$(H^\circ_T - H^\circ_0)/T = 4.96815$$

$$-(F^\circ_T - H^\circ_0)/T = 6.863753 \log_{10} M + 11.439588 \log_{10} T - 7.283739 + 4.575835 \log_{10} g_0$$

Using these formulae we have obtained the following results (in units of cal-$^\circ K^{-1}$-mole^{-1}):

$T(^\circ K)$	$(H^\circ_T - H^\circ_0)/T$	$-(F^\circ_T - H^\circ_0)/T$
1000	4.968	39.73
2000	"	43.28
3000	"	45.19
4000	"	46.62
5000	"	47.73
6000	"	48.64
7000	"	49.40
8000	"	50.07
9000	"	50.65
10,000	"	51.17

The value for ΔH_f ($T = 0^\circ K$) of Si^- was found from the JANAF value[7] of this quantity for Si (106.66 kcal/mole) and an electron affinity for Si of 1.46 ev (cf. Ref. 30), amounting to 33.67 kcal/mole. We find then that ΔH_f ($T = 0^\circ K$) for Si^- is 72.99 kcal/mole. The above values have been used in the composition calculations of the present work.

APPENDIX B

LISTING OF FIT COEFFICIENTS USED FOR THE THERMODYNAMIC FUNCTIONS OF THE SPECIES INCLUDED IN THE COMPOSITION CALCULATIONS.

On the next pages are given a listing of the fit coefficients used for the thermodynamic functions of the 19 species included in the HUG computer program calculations of the compositions of the silicon-hydrogen mixtures considered. The sources of the necessary data for which the fit coefficients were obtained are given in Table 1 of the present report.

The fit coefficients are given for each species in the order (from left to right): E, D, C, B, A, K, and H00, where the fits to the dimensionless enthalpy, $(H^{\circ}_T - H^{\circ}_0)/RT$, and the dimensionless free energy, $(F^{\circ}_T - H^{\circ}_0)/RT$, as functions of the temperature, T(°K), are defined by:

$$\frac{H^{\circ}_T - H^{\circ}_0}{RT} = A + BT + CT^2 + DT^3 + ET^4 \qquad \text{(B-1)}$$

$$\frac{F^{\circ}_T - H^{\circ}_0}{RT} = A(1 - \ln T) - BT - 1/2CT^2 - 1/3DT^3 - 1/4ET^4 - K \qquad \text{(B-2)}$$

The units in this listing are

A: dimensionless
B: $^{\circ}K^{-1}$
C: $^{\circ}K^{-2}$
D: $^{\circ}K^{-3}$
E: $^{\circ}K^{-4}$
K: dimensionless

H00 is the value for the heat of formation, ΔH_f, at 0° K, of the species, in units of cal-mole^{-1}. The set of fit coefficients given has been used for all 96 composition cases calculated.

HIGH TEMPERATURE THERMODYNAMIC FUNCTION FITS IN THE ORDER E, D, C, B, A, K, HOO

SI(G)	3.2249010E-16	-5.4505300E-12	2.9749250E-08	-3.4850430E-05	2.6118410E 00	5.2223819E 00	1.0496400E 05
H	1.8159260E-18	-2.1558800E-14	6.7029219E-11	3.7340679E-08	2.4996650E 00	-4.5792289E-01	5.1632000E 04
H2	-1.3005200E-16	3.3933900E-12	-4.0033299E-08	3.4879600E-04	3.1300060E 00	-2.3333390E 00	0.
SIH	-4.1734599E-16	9.8024329E-12	-9.2698258E-08	4.8914029E-04	3.3427220E 00	4.4527380E 00	1.1369900E 05
SIH2	-3.2631500E-15	6.2277099E-11	-4.6643800E-07	1.7555300E-03	3.4562550E 00	4.0467470E 00	4.7018000E 04
SIH3	-7.2660800E-15	1.3536600E-10	-9.8030199E-07	3.5198800E-03	3.3357240E 00	4.3425200E 00	2.3728000E 04
SIH4	-3.2442200E-15	7.5035839E-11	-6.9556630E-07	3.2725240E-03	4.9044250E 00	-5.3691050E 00	1.0085000E 04
SI2	-2.2107100E-16	4.8791359E-12	-4.2620549E-08	2.0851580E-04	4.0989439E 00	4.2917880E 00	1.3022300E 05
SI2H6	-4.7389000E-13	2.7816499E-09	-8.0598599E-06	1.5166800E-02	2.4702580E 00	1.1261090E 01	3.0000000E 04
SI3	-6.1570399E-16	1.3855720E-11	-1.2349210E-07	5.4615109E-04	6.2923680E 00	-5.1587320E 00	1.3252100E 05
E-	1.4933480E-18	-1.4344400E-14	3.3476400E-12	3.1453590E-07	2.4990700E 00	-1.1727960E 01	0.
SI&	7.3384120E-18	-1.0040800E-13	2.1543480E-09	-2.7537250E-05	2.6455090E 00	4.5952640E 00	2.9368000E 05
SI-	1.0733000E-18	-3.0054400E-14	3.1254800E-10	-1.4412300E-06	2.5025040E 00	5.2108780E 00	7.2990000E 04
H&	-3.4057300E-18	5.6666500E-14	-3.3783599E-10	8.5041859E-07	2.4991030E 00	-1.1497770E 00	3.6523600E 05
H-	1.8159260E-18	-2.1558800E-14	6.7029219E-11	3.7340679E-08	2.4996650E 00	-1.1511780E 00	3.4200000E 04
H2&	-3.6711400E-16	1.4596400E-11	-2.1762600E-07	1.3394200E-03	1.8011890E 00	6.4994490E 00	3.5722000E 05
H3&	1.3967800E-15	-4.6296400E-11	5.3973399E-07	-2.3381599E-03	9.5314479E 00	-3.8112350E 01	2.6138600E 05
SIH&	2.6208600E-16	-3.1613400E-12	-3.3075300E-08	5.7278100E-04	3.2856880E 00	2.0074420E 00	2.6801000E 05
SI(C)	-8.6242900E-14	7.3064629E-10	-2.3439220E-06	3.6107150E-03	5.3137879E-01	-2.5267280E 00	0.

FOLDOUT FRAME 1

FOLDOUT FRAME 2

APPENDIX C

EQUILIBRIUM COMPOSITIONS OF THE SILICON-HYDROGEN MIXTURES

The following pages give the equilibrium compositions, in terms of mole fractions, for the silicon-hydrogen mixtures considered in this work. The silicon/hydrogen mass ratios, total gas pressures (in atmospheres), and gas temperatures (in $^\circ$K) are as printed. The arrangement of the cases will be obvious upon inspection.

In cases where no solid silicon was found to be present, there appears the statement "MOLES OF SOLID = 0.". Elsewhere, the number of moles is given (this occurred only for some cases with a gas temperature of 1600°K). For each case the last mole fraction printed out is for solid silicon, Si(c) (excepting for cases with Si/H mass ratio = 0.). In cases where "MOLES OF SOLID = 0." is printed, the mole fraction of Si(c) printed is an extraneous number, and should be disregarded. Where a non-zero "moles of solid" was found, the mole fraction of Si(c) is the ratio of "moles of solid" to "moles of gas"; the mole fraction of the solid is not considered in the normalization of the mole fractions of the gas-phase species.

In cases where the mole fraction of free electrons, e^-, was less than $1. \times 10^{-6}$ it is not possible with the HUG program as used on the IBM 7094 machine to compute mole fractions for e^- or for any ionic species; these species are for these cases deleted from the HUG program input data, and do not appear in the print-out. For temperatures of 4000°K and less for all cases with Si/H mass ratios of 0.005, 0.01, and 0.05 and for temperatures of 5000°K and less for all cases with Si/H mass ratio = 0. and the case Si/H mass ratio = 0.005, gas pressure = 1000 atm., it was not possible to compute the mole fractions for free electrons and the ionic species.

All mole fractions are in floating point notation; the value $1.8048514 \times 10^{-35}$, where it appears, is actually the machine zero and is not a true value.

The mole fractions for the various species appear in four different formats and are printed out in the following fashions:

I. Cases where mole fractions for 19 species are printed out. The format is:

Si(g)	H	H_2	SiH	SiH_2	SiH_3	SiH_4
Si_2	Si_2H_6	Si_3	e^-	Si^+	Si^-	H^+
H^-	H_2^+	H_3^+	SiH^+	Si(c)		

II. Cases where mole fractions for 11 species are printed out. The format is:

Si(g)	H	H_2	SiH	SiH_2	SiH_3	SiH_4
Si_2	Si_2H_6	Si_3	Si(c)			

III. Cases where mole fractions for 7 species are printed out. The format is:

H	H_2	e^-	H^+	H^-	H_2^+	H_3^+

IV. Cases where mole fractions for 2 species are printed out. The format is:

H	H_2	---	---	---	---	---

Si/H Mass Ratio = 0.0

TEMPERATURE =10000.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.99305 MOLES OF SOLID = 0.
9.8657484E-01 9.0888894E-03 2.1297694E-03 2.1319717E-03 3.8353128E-05 3.5496356E-05 6.5441681E-07

TEMPERATURE = 8000.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.96679 MOLES OF SOLID = 0.
9.6497282E-01 3.4565600E-02 2.2227956E-04 2.2137829E-04 8.5196267E-06 8.6060599E-06 8.6045885E-07

TEMPERATURE = 6500.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.87907 MOLES OF SOLID = 0.
8.6238418E-01 1.3757881E-01 1.7228147E-05 1.6018101E-05 1.2773129E-06 1.4313715E-06 1.0803003E-06

TEMPERATURE = 5000.0000 PRESSURE = 100.00000 MOLES OF GAS = 1.30485 MOLES OF SOLID = 0.
4.6725894E-01 5.3274075E-01

TEMPERATURE = 4000.0000 PRESSURE = 100.00000 MOLES OF GAS = 1.07909 MOLES OF SOLID = 0.
1.4658507E-01 8.5341457E-01

TEMPERATURE = 3000.0000 PRESSURE = 100.00000 MOLES OF GAS = 1.00786 MOLES OF SOLID = 0.
1.5600816E-02 9.8439916E-01

TEMPERATURE = 2200.0000 PRESSURE = 100.00000 MOLES OF GAS = 1.00028 MOLES OF SOLID = 0.
5.6094062E-04 9.9943902E-01

TEMPERATURE = 1600.0000 PRESSURE = 100.00000 MOLES OF GAS = 1.00000 MOLES OF SOLID = 0.
5.4128355E-06 9.9999458E-01

FOLDOUT FRAME 1

FOLDOUT FRAME 2

Si/H Mass Ratio = 0.0

TEMPERATURE =10000.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.95991 MOLES OF SOLID = 0.
9.5534730E-01 4.2613119E-02 9.3801196E-04 9.3749062E-04 8.1785775E-05 7.5573673E-05 6.7459384E-06

TEMPERATURE = 8000.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.87888 MOLES OF SOLID = 0.
8.6189556E-01 1.3787745E-01 9.6901789E-05 9.0713611E-05 1.6586789E-05 1.5748940E-05 7.0321252E-06

TEMPERATURE = 6500.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.73064 MOLES OF SOLID = 0.
6.3132207E-01 3.6865655E-01 8.4140073E-06 4.8020514E-06 2.2833988E-06 1.5706823E-06 4.3391102E-06

TEMPERATURE = 5000.0000 PRESSURE = 500.00000 MOLES OF GAS = 1.14170 MOLES OF SOLID = 0.
2.4823141E-01 7.5176857E-01

TEMPERATURE = 4000.0000 PRESSURE = 500.00000 MOLES OF GAS = 1.03546 MOLES OF SOLID = 0.
6.8488674E-02 9.3151131E-01

TEMPERATURE = 3000.0000 PRESSURE = 500.00000 MOLES OF GAS = 1.00352 MOLES OF SOLID = 0.
7.0072843E-03 9.9299270E-01

TEMPERATURE = 2200.0000 PRESSURE = 500.00000 MOLES OF GAS = 1.00013 MOLES OF SOLID = 0.
2.5089921E-04 9.9974909E-01

TEMPERATURE = 1600.0000 PRESSURE = 500.00000 MOLES OF GAS = 1.00000 MOLES OF SOLID = 0.
2.4206974E-06 9.9999757E-01

FOLDOUT FRAME 1

FOLDOUT FRAME 2

Si/H Mass Ratio = 0.0

TEMPERATURE =10000.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.92727 MOLES OF SOLID = 0.
9.1951801E-01 7.8953474E-02 6.5442078E-04 6.4667665E-04 1.0983871E-04 1.0035055E-04 1.7243307E-05

TEMPERATURE = 8000.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.81725 MOLES OF SOLID = 0.
7.7618347E-01 2.2363653E-01 6.8790770E-05 5.7537861E-05 2.1208037E-05 1.7991706E-05 1.4469295E-05

TEMPERATURE = 6500.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.67252 MOLES OF SOLID = 0.
5.1304916E-01 4.8693160E-01 6.6808701E-06 2.4573934E-06 2.9467952E-06 1.3063941E-06 5.8657628E-06

TEMPERATURE = 5000.0000 PRESSURE =1000.00000 MOLES OF GAS = 1.10071 MOLES OF SOLID = 0.
1.8298468E-01 8.1701530E-01

TEMPERATURE = 4000.0000 PRESSURE =1000.00000 MOLES OF GAS = 1.02508 MOLES OF SOLID = 0.
4.8934472E-02 9.5106552E-01

TEMPERATURE = 3000.0000 PRESSURE =1000.00000 MOLES OF GAS = 1.00249 MOLES OF SOLID = 0.
4.9600034E-03 9.9503999E-01

TEMPERATURE = 2200.0000 PRESSURE =1000.00000 MOLES OF GAS = 1.00009 MOLES OF SOLID = 0.
1.7741905E-04 9.9982257E-01

TEMPERATURE = 1600.0000 PRESSURE =1000.00000 MOLES OF GAS = 1.00000 MOLES OF SOLID = 0.
1.7116921E-06 9.9999828E-01

FOLDOUT FRAME 2

FOLDOUT FRAME 1

FOLDOUT FRAME

TEMPERATURE =10000.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.99310 MOLES OF SOLID = 0.

8.2859296E-05	9.8639665E-01	9.0856061E-03	2.6830328E-07	2.5883471E-09	5.8487200E-12	3.8947673E-15
1.7012546E-11	1.8048514E-35	1.1323268E-18	2.1781074E-03	9.7095054E-05	4.8237062E-09	2.0842811E-03
3.9216519E-05	3.4696060E-05	6.3954690E-07	6.1712167E-07	1.8048514E-35		

TEMPERATURE = 8000.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.96683 MOLES OF SOLID = 0.

1.1738491E-04	9.6479491E-01	3.4552856E-02	7.4995257E-07	4.6392161E-08	3.6427229E-10	3.1276211E-13
1.1878872E-10	1.8048514E-35	4.2895586E-17	2.5718071E-04	6.6526425E-05	2.2841500E-09	1.9130050E-04
9.8555157E-06	7.4354166E-06	7.4327754E-07	1.0621919E-06	2.5650787E-23		

TEMPERATURE = 6500.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.87912 MOLES OF SOLID = 0.

1.7212224E-04	8.6222161E-01	1.3752694E-01	2.0934995E-06	7.5082000E-07	1.5874506E-08	2.8944409E-11
9.7097412E-10	1.8048514E-35	2.2907502E-15	3.5605055E-05	2.8220818E-05	1.3024165E-09	7.7491852E-06
2.6392982E-06	6.9233373E-07	5.2242720E-07	1.1928773E-06	4.8466398E-17		

TEMPERATURE = 5000.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.65249 MOLES OF SOLID = 0.

2.4639593E-04	4.6717403E-01	5.3254716E-01	5.3075806E-06	1.8857252E-05	1.2169836E-06	5.4866698E-09
1.5828716E-08	6.3015684E-24	5.7644405E-13	3.1430049E-06	3.0959024E-06	7.0430651E-10	1.6955267E-08
3.6463267E-07	3.5729571E-09	5.1483150E-08	4.1437461E-07	4.0956737E-14		

TEMPERATURE = 4000.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.53955 MOLES OF SOLID = 0.

1.9506219E-04	1.4655876E-01	8.5310836E-01	4.6433201E-06	1.1723736E-04	1.5885012E-05	1.1957349E-07
8.9238214E-08	2.8181317E-16	3.3769823E-11	7.6384875E-13			

TEMPERATURE = 3000.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.50383 MOLES OF SOLID = 0.

2.5994477E-05	1.5598013E-02	9.8404552E-01	5.1494390E-07	2.4265767E-04	8.6146493E-05	1.1625293E-06
5.7329042E-08	7.5254570E-13	2.1172815E-10	8.0544282E-12			

TEMPERATURE = 2200.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.50000 MOLES OF SOLID = 0.

3.6855900E-07	5.6083986E-04	9.9907994E-01	4.9073014E-09	1.4673999E-04	2.0577181E-04	6.3134433E-06
1.9414483E-09	2.0232886E-11	5.2959329E-11	6.2317249E-11			

TEMPERATURE = 1600.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.49982 MOLES OF SOLID = 0.

3.8861388E-10	5.4118626E-06	9.9963524E-01	2.8310256E-12	2.8837525E-05	3.0012481E-04	3.0364838E-05
2.6514074E-12	1.7227020E-10	5.1276939E-13	5.0234542E-10			

Si/H Mass Ratio = 0.005

TEMPERATURE =10000.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.95995 MOLES OF SOLID = 0.

1.1993854E-04	9.5517480E-01	4.2597733E-02	1.8803759E-06	8.7829927E-08	9.6090788E-10	3.0981602E-12
1.7822732E-10	1.8048514E-35	8.5854727E-17	9.6837453E-04	6.3223796E-05	1.5521454E-08	9.0793239E-04
8.4417863E-05	7.3177691E-05	6.5308860E-06	1.9456086E-06	1.8048514E-35		

TEMPERATURE = 8000.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.87893 MOLES OF SOLID = 0.

1.5660623E-04	8.6173792E-01	1.3782702E-01	4.4682845E-06	1.2344161E-06	4.3286594E-08	1.6597833E-10
1.0571554E-09	1.8048514E-35	2.5464956E-15	1.1643283E-04	3.9208840E-05	6.8980818E-09	7.5483025E-05
1.9926295E-05	1.3102338E-05	5.8493087E-06	2.7957800E-06	1.7110680E-22		

TEMPERATURE = 6500.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.73070 MOLES OF SOLID = 0.

2.0713618E-04	6.3120614E-01	3.6852118E-01	9.2217675E-06	1.2105963E-05	9.3688438E-07	6.2527753E-09
7.0309755E-09	1.8048514E-35	9.9810120E-14	1.7024372E-05	1.4205585E-05	3.7471258E-09	2.3728971E-06
4.6192368E-06	7.7599812E-07	2.1433508E-06	2.1978986E-06	2.9162837E-16		

TEMPERATURE = 5000.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.57085 MOLES OF SOLID = 0.

1.8509029E-04	2.4818658E-01	7.5149709E-01	1.0590494E-05	9.9946524E-05	1.7133407E-05	2.0518101E-07
4.4659709E-08	6.2450569E-21	6.1086808E-12	1.2697239E-06	1.1513388E-06	1.0686755E-09	4.4593347E-09
3.9128147E-07	2.4961049E-09	9.5536582E-08	4.0933473E-07	1.5383155E-13		

TEMPERATURE = 4000.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.51765 MOLES OF SOLID = 0.

6.4324602E-05	6.8476373E-02	9.3117672E-01	3.5771029E-06	2.1099287E-04	6.6786451E-05	1.1744501E-06
4.8520880E-08	2.4907642E-14	3.0274762E-11	1.2594512E-12			

TEMPERATURE = 3000.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.50163 MOLES OF SOLID = 0.

4.1245226E-06	7.0060256E-03	9.9263594E-01	1.8349523E-07	1.9419194E-04	1.5482719E-04	4.6923025E-06
7.2165498E-09	1.2154075E-11	2.1144433E-11	6.3899452E-12			

TEMPERATURE = 2200.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.49990 MOLES OF SOLID = 0.

4.1457911E-08	2.5085413E-04	9.9938986E-01	1.2345122E-09	8.2556918E-05	2.5890668E-04	1.7765442E-05
1.2282775E-10	1.6015570E-10	1.8844448E-12	3.5049242E-11			

TEMPERATURE = 1600.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.49981 MOLES OF SOLID = 0.

3.2766806E-11	2.4202625E-06	9.9963820E-01	5.3375886E-13	1.2157519E-05	2.8292712E-04	6.4007268E-05
9.4249243E-14	7.6546518E-10	7.6843920E-15	2.1178157E-10			

FOLDOUT FRAME 1

FOLDOUT FRAME 2

Si/H Mass Ratio = 0.005

TEMPERATURE =10000.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.92731 MOLES OF SOLID = 0.

1.3525268E-04	9.1935209E-01	7.8924984E-02	4.0818852E-06	3.6701820E-07	7.7295809E-09	4.7974126E-11
4.5329241E-10	1.8048514E-35	4.9247643E-16	6.7785693E-04	5.0926400E-05	2.4504407E-08	6.2420586E-04
1.1375174E-04	9.6846080E-05	1.6638128E-05	3.0168027E-06	1.8048514E-35		

TEMPERATURE = 8000.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.81731 MOLES OF SOLID = 0.

1.7211246E-04	7.7604209E-01	2.2355507E-01	8.8447204E-06	4.4009347E-06	2.7795656E-07	1.9196181E-09
2.5537318E-09	1.8048514E-35	1.3521115E-14	8.3030630E-05	3.0213033E-05	1.0812459E-08	4.7661366E-05
2.5593489E-05	1.4900677E-05	1.1981243E-05	3.8801937E-06	3.7609749E-22		

TEMPERATURE = 6500.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.67257 MOLES OF SOLID = 0.

2.0438328E-04	5.1295578E-01	4.8675440E-01	1.4789119E-05	3.1554858E-05	3.9690943E-06	4.3054351E-08
1.3690661E-08	1.8048514E-35	3.8353301E-13	1.2173147E-05	9.8013697E-06	5.2874891E-09	1.3484219E-06
5.3683486E-06	7.1671473E-07	3.2174927E-06	2.4647564E-06	5.7550498E-16		

TEMPERATURE = 5000.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.55031 MOLES OF SOLID = 0.

1.2745508E-04	1.8295182E-01	8.1672186E-01	1.0751724E-05	1.4959527E-04	3.7807883E-05	6.6752005E-07
4.2353842E-08	6.0819616E-20	7.9786215E-12	2.1185992E-13			

TEMPERATURE = 4000.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.51244 MOLES OF SOLID = 0.

3.2199520E-05	4.8925682E-02	9.5072385E-01	2.5587619E-06	2.1567127E-04	9.7552632E-05	2.4513839E-06
2.4316622E-08	1.0628302E-13	1.5189983E-11	1.2609086E-12			

TEMPERATURE = 3000.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.50110 MOLES OF SOLID = 0.

1.7356651E-06	4.9591125E-03	9.9468247E-01	1.0931487E-07	1.6377510E-04	1.8485287E-04	7.9309859E-06
2.5559015E-09	3.4650529E-11	6.3027880E-12	5.3779826E-12			

TEMPERATURE = 2200.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.49987 MOLES OF SOLID = 0.

1.5377965E-08	1.7738717E-04	9.9946331E-01	6.4761632E-10	6.1250112E-05	2.7166119E-04	2.6362786E-05
3.3799441E-11	3.5264770E-10	3.8469617E-13	2.6001600E-11			

TEMPERATURE = 1600.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.49980 MOLES OF SOLID = 0.

1.0892256E-11	1.7113847E-06	9.9963888E-01	2.5092500E-13	8.0827461E-06	2.6601353E-04	8.5108627E-05
2.0829327E-14	1.3533612E-09	1.1290693E-15	1.4079975E-10			

FOLDOUT FRAME 1

FOLDOUT FRAME 2

TEMPERATURE =10000.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.99315 MOLES OF SOLID = 0.

1.6744062E-04	9.8621684E-01	9.0822941E-03	5.4208373E-07	5.2285799E-09	1.1812528E-11	7.8647392E-15
6.9471781E-11	1.8048514E-35	9.3439511E-18	2.2263700E-03	1.9195466E-04	9.9636501E-09	2.0387270E-03
4.0078171E-05	3.3931556E-05	6.2534093E-07	1.2199128E-06	1.8048514E-35		

TEMPERATURE = 8000.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.96687 MOLES OF SOLID = 0.

2.4457842E-04	9.6461126E-01	3.4539703E-02	1.5622733E-06	9.6624027E-08	7.5854969E-10	6.5116239E-13
5.1568796E-10	1.8048514E-35	3.8799880E-16	2.9029356E-04	1.2280077E-04	5.3719190E-09	1.6944721E-04
1.1122327E-05	6.5847751E-06	6.5811832E-07	1.9603211E-06	5.3444927E-23		

TEMPERATURE = 6500.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.87917 MOLES OF SOLID = 0.

3.5699980E-04	8.6205876E-01	1.3747500E-01	4.3413200E-06	1.5566923E-06	3.2906758E-08	5.9988437E-11
4.1770498E-09	1.8048514E-35	2.0439522E-14	4.8107375E-05	4.3321211E-05	3.6498995E-09	5.7342155E-06
3.5653853E-06	5.1221403E-07	3.8643783E-07	1.8308160E-06	1.0052446E-16		

TEMPERATURE = 5000.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.65255 MOLES OF SOLID = 0.

4.9376439E-04	4.6708993E-01	5.3235544E-01	1.0634195E-05	3.7775325E-05	2.4374534E-06	1.0987081E-08
6.3565021E-08	2.5278529E-23	4.6389092E-12	4.4669723E-06	4.3652119E-06	2.0059315E-09	1.1927740E-08
5.1813812E-07	2.5130624E-09	3.6204478E-08	5.8416155E-07	8.2075124E-14		

TEMPERATURE = 4000.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.53956 MOLES OF SOLID = 0.

3.8912994E-04	1.4653254E-01	8.5280302E-01	9.2613099E-06	2.3379334E-04	3.1672032E-05	2.3836665E-07
3.5513533E-07	1.1203095E-15	2.6809793E-10	1.5238034E-12			

TEMPERATURE = 3000.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.50373. MOLES OF SOLID = 0.

5.1911688E-05	1.5595219E-02	9.8369293E-01	1.0281729E-06	4.8442042E-04	1.7194447E-04	2.3199398E-06
2.2863502E-07	2.9980169E-12	1.6862842E-09	1.6084912E-11			

TEMPERATURE = 2200.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.49985 MOLES OF SOLID = 0.

7.3663909E-07	5.6073928E-04	9.9872165E-01	9.8064678E-09	2.9318411E-04	4.1105499E-04	1.2609633E-05
7.7557052E-09	8.0739472E-11	4.2284926E-10	1.2455352E-10			

TEMPERATURE = 1600.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.49964 MOLES OF SOLID = 0.

7.7684243E-10	5.4108924E-06	9.9927666E-01	5.6582280E-12	5.7625779E-05	5.9962934E-04	6.0656038E-05
1.0595116E-11	6.8765739E-10	4.0960578E-12	1.0041927E-09			

TEMPERATURE =10000.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.95999 MOLES OF SOLID = 0.

2.4206355E-04	9.5500100E-01	4.2582231E-02	3.7943403E-06	1.7719646E-07	1.9382746E-09	6.2482504E-12
7.2596470E-10	1.8048514E-35	7.0579084E-16	9.9833865E-04	1.2377035E-04	3.2295167E-08	8.8052145E-04
8.7014146E-05	7.0955511E-05	6.3314106E-06	3.8081367E-06	1.8048514E-35		

TEMPERATURE = 8000.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.87898 MOLES OF SOLID = 0.

3.2137287E-04	8.6157736E-01	1.3777566E-01	9.1676929E-06	2.5322109E-06	8.8779113E-08	3.4035163E-10
4.4518361E-09	1.8048514E-35	2.2006113E-14	1.3399440E-04	6.9915413E-05	1.6290698E-08	6.5577856E-05
2.2927507E-05	1.1380876E-05	5.0798464E-06	4.9843786E-06	3.5112954E-22		

TEMPERATURE = 6500.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.73076 MOLES OF SOLID = 0.

4.2063451E-04	6.3109035E-01	3.6838599E-01	1.8723345E-05	2.4574741E-05	1.9014981E-06	1.2688289E-08
2.8994355E-08	1.8048514E-35	8.3583659E-13	2.2731200E-05	2.1605127E-05	1.0160112E-08	1.7768386E-06
6.1665434E-06	5.8096513E-07	1.6043643E-06	3.3421480E-06	5.9221404E-16		

TEMPERATURE = 5000.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.57086 MOLES OF SOLID = 0.

3.7014377E-04	2.4814205E-01	7.5122743E-01	2.1175082E-05	1.9980147E-04	3.4244967E-05	4.1002681E-07
1.7860332E-07	2.4948385E-20	4.8854873E-11	1.7487857E-06	1.6717166E-06	2.9434726E-09	3.2371646E-09
5.3881378E-07	1.8116724E-09	6.9327985E-08	5.9423766E-07	3.0763251E-13		

TEMPERATURE = 4000.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.51757 MOLES OF SOLID = 0.

1.2849564E-04	6.8464104E-02	9.3084303E-01	7.1443861E-06	4.2133098E-04	1.3334176E-04	2.3444153E-06
1.9362046E-07	9.9286047E-14	2.4133186E-10	2.5158954E-12			

TEMPERATURE = 3000.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.50150 MOLES OF SOLID = 0.

8.2429487E-06	7.0047691E-03	9.9228001E-01	3.6665349E-07	3.8795765E-04	3.0925910E-04	9.3709452E-06
2.8823547E-08	4.8492263E-11	1.6878065E-10	1.2770445E-11			

TEMPERATURE = 2200.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.49974 MOLES OF SOLID = 0.

8.2869160E-08	2.5080913E-04	9.9903140E-01	2.4671926E-09	1.6496174E-04	5.1724356E-04	3.5485419E-05
4.9075834E-10	6.3921368E-10	1.5050125E-11	7.0059035E-11			

TEMPERATURE = 1600.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.49962 MOLES OF SOLID = 0.

6.5548769E-11	2.4198284E-06	9.9927962E-01	1.0675730E-12	2.4311937E-05	5.6568050E-04	1.2795227E-04
3.7717129E-13	3.0599808E-09	6.1517743E-14	4.2366109E-10			

FOLDOUT FRAME 1

FOLDOUT FRAME 2

Si/H Mass Ratio = 0.01

TEMPERATURE =10000.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.92735 MOLES OF SOLID = 0.

2.7260733E-04	9.1918516E-01	7.8896326E-02	8.2257144E-06	7.3947170E-07	1.5570806E-08	9.8623603E-11
1.8414582E-09	1.8048514E-35	4.0323721E-15	7.0085114E-04	9.9276608E-05	5.1065031E-08	6.0361668E-04
1.1758906E-04	9.3634651E-05	1.6083483E-05	5.8799279E-06	1.8048514E-35		

TEMPERATURE = 8000.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.81736 MOLES OF SOLID = 0.

3.5087838E-04	7.7589887E-01	2.2347257E-01	1.8028030E-05	8.9686875E-06	5.6634459E-07	3.9105562E-09
1.0613629E-08	1.8048514E-35	1.1456327E-13	9.5596309E-05	5.3497788E-05	2.5378828E-08	4.1388865E-05
2.9461318E-05	1.2937278E-05	1.0400606E-05	6.8693360E-06	7.6673413E-22		

TEMPERATURE = 6500.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.67261 MOLES OF SOLID = 0.

4.1262783E-04	5.1286249E-01	4.8657735E-01	2.9852207E-05	6.3682686E-05	8.0088029E-06	8.6858870E-08
5.5802122E-08	1.8048514E-35	3.1560378E-12	1.5915903E-05	1.5134619E-05	1.3956968E-08	1.0311418E-06
7.0176244E-06	5.4797395E-07	2.4595305E-06	3.8052197E-06	1.1618825E-15		

TEMPERATURE = 5000.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.55027 MOLES OF SOLID = 0.

2.5400012E-04	1.8291888E-01	8.1642780E-01	2.1422829E-05	2.9801529E-04	7.5305158E-05	1.3293167E-06
1.6820798E-07	2.4128398E-19	6.3147838E-11	1.0577554E-06	9.4830377E-07	2.4434434E-09	1.9726236E-09
4.8048028E-07	1.6275984E-09	9.1825739E-08	4.9697344E-07	4.2220731E-13		

TEMPERATURE = 4000.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.51233 MOLES OF SOLID = 0.

6.4337660E-05	4.8916912E-02	9.5038304E-01	5.1117298E-06	4.3077696E-04	1.9481452E-04	4.8945842E-06
9.7081168E-08	4.2386595E-13	1.2117275E-10	2.5194134E-12			

TEMPERATURE = 3000.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.50096 MOLES OF SOLID = 0.

3.4689980E-06	4.9582230E-03	9.9432577E-01	2.1844368E-07	3.2721273E-04	3.6925859E-04	1.5839947E-05
1.0209873E-08	1.3826704E-10	5.0320740E-11	1.0748738E-11			

TEMPERATURE = 2200.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.49970 MOLES OF SOLID = 0.

3.0739531E-08	1.7735535E-04	9.9910481E-01	1.2943099E-09	1.2239098E-04	5.4274048E-04	5.2659661E-05
1.3505360E-10	1.4075710E-09	3.0726491E-12	5.1975471E-11			

TEMPERATURE = 1600.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.49960 MOLES OF SOLID = 0.

2.1782315E-11	1.7110775E-06	9.9928007E-01	5.0170932E-13	1.6158061E-05	5.3168697E-04	1.7007791E-04
8.3300505E-14	5.4065261E-09	9.0298244E-15	2.8157111E-10			

FOLDOUT FRAME 1

FOLDOUT FRAME 2

Si/H Mass Ratio = 0.05

TEMPERATURE =10000.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.99356 MOLES OF SOLID = 0.

9.0724077E-04	9.8471948E-01	9.0547360E-03	2.9327042E-06	2.8243967E-08	6.3712538E-11	4.2355177E-14
2.0395387E-09	1.8048514E-35	1.4863319E-15	2.6108135E-03	8.8691479E-04	6.3308011E-08	1.7358840E-03
4.6927401E-05	2.8847323E-05	5.3083397E-07	5.6275138E-06	1.8048514E-35		

TEMPERATURE = 8000.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.96716 MOLES OF SOLID = 0.

1.4227761E-03	9.6309359E-01	3.4431102E-02	9.0738494E-06	5.6031956E-07	4.3918847E-09	3.7641975E-12
1.7451140E-08	1.8048514E-35	7.6381030E-14	5.0220768E-04	4.1292725E-04	5.4062208E-08	9.7792302E-05
1.9211346E-05	3.7942626E-06	3.7862262E-07	6.5813631E-06	3.1090306E-22		

TEMPERATURE = 6500.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.87950 MOLES OF SOLID = 0.

1.8951121E-03	8.6078022E-01	1.3706752E-01	2.3011457E-05	8.2391133E-06	1.7390745E-07	3.1656003E-10
1.1770729E-07	1.8048514E-35	3.0575345E-12	1.0501308E-04	1.0535029E-04	4.2294074E-08	2.6229962E-06
7.7712984E-06	2.3395404E-07	1.7624393E-07	4.4456502E-06	5.3362815E-16		

TEMPERATURE = 5000.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.65304 MOLES OF SOLID = 0.

2.4743553E-03	4.6641945E-01	5.3082821E-01	5.3213652E-05	1.8875690E-04	1.2162058E-05	5.4743078E-08
1.5962567E-06	6.2935151E-22	5.8377132E-10	9.9344647E-06	9.8359525E-06	2.2355770E-08	5.3555387E-09
1.1506756E-06	1.1267416E-09	1.6209126E-08	1.3143778E-06	4.1129539E-13		

TEMPERATURE = 4000.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.53960 MOLES OF SOLID = 0.

1.9370845E-03	1.4632304E-01	8.5036633E-01	4.6036785E-05	1.1604952E-03	1.5698777E-04	1.1798156E-06
8.8003869E-06	2.7524391E-14	3.3071605E-08	7.5854768E-12			

TEMPERATURE = 3000.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.50293 MOLES OF SOLID = 0.

2.5970580E-04	1.5572840E-02	9.8087178E-01	5.1364020E-06	2.4165271E-03	8.5651252E-04	1.1539808E-05
5.7223678E-06	7.4391809E-11	2.1114470E-07	8.0470232E-11			

TEMPERATURE = 2200.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.49870 MOLES OF SOLID = 0.

3.7003319E-06	5.5993217E-04	9.9584863E-01	4.9189569E-08	1.4685053E-03	2.0559351E-03	6.2977635E-05
1.9570113E-07	2.0197838E-09	5.3597388E-08	6.2566538E-10			

TEMPERATURE = 1600.0000 PRESSURE = 100.00000 MOLES OF GAS = 0.49874 MOLES OF SOLID = 0.00106

1.5945063E-09	5.4088506E-06	9.9852270E-01	1.1609404E-11	1.1819048E-04	1.2293753E-03	1.2431159E-04
4.4636723E-11	2.8905157E-09	3.5419796E-11	2.1195857E-03			

FOLDOUT FRAME 1

FOLDOUT FRAME 2

TEMPERATURE =10000.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.96031 MOLES OF SOLID = 0.

1.2900770E-03	9.5356895E-01	4.2454620E-02	2.0191603E-05	9.4153788E-07	1.0283627E-08	3.3100742E-11
2.0619971E-08	1.8048514E-35	1.0684022E-13	1.2257307E-03	5.3726148E-04	2.1132018E-07	7.1609564E-04
1.0667320E-04	5.7618966E-05	5.1336718E-06	1.6505546E-05	1.8048514E-35		

TEMPERATURE = 8000.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.87933 MOLES OF SOLID = 0.

1.7424728E-03	8.6027929E-01	1.3736083E-01	4.9632026E-05	1.3688220E-05	4.7918486E-07	1.8342790E-09
1.3087378E-07	1.8048514E-35	3.5076284E-12	2.3624154E-04	2.1501072E-04	1.5572774E-07	3.7139224E-05
4.0361900E-05	6.4357104E-06	2.8682472E-06	1.5305355E-05	1.9038121E-21		

TEMPERATURE = 6500.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.73118 MOLES OF SOLID = 0.

2.1568994E-03	6.3017243E-01	3.6731513E-01	9.5868570E-05	1.2564628E-04	9.7078813E-06	6.4684387E-08
7.6236582E-07	1.8048514E-35	1.1269285E-10	4.8515722E-05	5.1906492E-05	1.1119459E-07	8.3129600E-07
1.3142252E-05	2.7140988E-07	7.4842171E-07	8.0178578E-06	3.0367124E-15		

TEMPERATURE = 5000.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.57088 MOLES OF SOLID = 0.

1.8498067E-03	2.4778636E-01	7.4907536E-01	1.0567155E-04	9.9565449E-04	1.7040556E-04	2.0374000E-06
4.4606830E-06	6.1775531E-19	6.0978349E-09	3.8895760E-06	3.7562363E-06	3.2717613E-08	1.4533698E-09
1.1966893E-06	8.1220937E-10	3.1036589E-08	1.3332987E-06	1.5374047E-12		

TEMPERATURE = 4000.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.51694 MOLES OF SOLID = 0.

6.4265646E-04	6.8365879E-02	9.2817402E-01	3.5680577E-05	2.1011974E-03	6.6402749E-04	1.1658185E-05
4.8431981E-06	2.4622269E-12	3.0191598E-08	1.2582969E-11			

TEMPERATURE = 3000.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.50047 MOLES OF SOLID = 0.

4.1377490E-05	6.9946921E-03	9.8942701E-01	1.8378587E-06	1.9418488E-03	1.5457111E-03	4.6769637E-05
7.2629076E-07	1.2113905E-09	2.1348500E-08	6.4104371E-11			

TEMPERATURE = 2200.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.49843 MOLES OF SOLID = 0.

4.1657938E-07	2.5044792E-04	9.9615591E-01	1.2384599E-08	8.2686822E-04	2.5889415E-03	1.7735816E-04
1.2401589E-08	1.6014021E-08	1.9118543E-09	3.5218357E-10			

TEMPERATURE = 1600.0000 PRESSURE = 500.00000 MOLES OF GAS = 0.49811 MOLES OF SOLID = 0.00006

3.1890132E-10	2.4164844E-06	9.9651978E-01	5.1866733E-12	1.1795338E-04	2.7406997E-03	6.1906694E-04
8.9273443E-12	7.1828904E-08	7.0839589E-12	1.1810012E-04			

FOLDOUT FRAME 1

FOLDOUT FRAME 2

TEMPERATURE =10000.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.92767 MOLES OF SOLID = 0.

1.4374407E-03	9.1781731E-01	7.8661686E-02	4.3309107E-05	3.8875892E-06	8.1737832E-08	5.0646405E-10
5.1199606E-08	1.8048514E-35	5.9117722E-13	8.7175773E-04	4.2085186E-04	3.3492380E-07	4.8455653E-04
1.4604616E-04	7.5053862E-05	1.2872705E-05	2.4889007E-05	1.8048514E-35		

TEMPERATURE = 8000.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.81774 MOLES OF SOLID = 0.

1.8610821E-03	7.7474533E-01	2.2280858E-01	9.5479697E-05	4.7429172E-05	2.9905508E-06	2.0618777E-08
2.9859444E-07	1.8048514E-35	1.7095122E-11	1.6760799E-04	1.6184197E-04	2.3601197E-07	2.3571316E-05
5.1577418E-05	7.3569369E-06	5.9056350E-06	2.0750279E-05	4.0668085E-21		

TEMPERATURE = 6500.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.67292 MOLES OF SOLID = 0.

2.0974900E-03	5.1212014E-01	4.8516975E-01	1.5152656E-04	3.2277848E-04	4.0534211E-05	4.3897442E-07
1.4418946E-06	1.8048514E-35	4.1453994E-10	3.3205629E-05	3.6875041E-05	1.4801743E-07	4.9352474E-07
1.4619800E-05	2.6189147E-07	1.1737741E-06	9.2578827E-06	5.9061394E-15		

TEMPERATURE = 5000.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.54996 MOLES OF SOLID = 0.

1.2703556E-03	1.8265651E-01	8.1408736E-01	1.0699040E-04	1.4862200E-03	3.7501262E-04	6.6103779E-06
4.2075499E-06	5.9837139E-18	7.9001001E-09	2.2979427E-06	2.1831565E-06	2.6548963E-08	9.0670675E-10
1.0423322E-06	7.4704466E-10	4.2086257E-08	1.1424763E-06	2.1116266E-12		

TEMPERATURE = 4000.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.51151 MOLES OF SOLID = 0.

3.2240312E-04	4.8846629E-02	9.4765404E-01	2.5578638E-05	2.1524723E-03	9.7203521E-04	2.4386646E-05
2.4378271E-06	1.0552368E-11	1.5247790E-08	1.2625060E-11			

TEMPERATURE = 3000.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.49985 MOLES OF SOLID = 0.

1.7423105E-05	4.9510869E-03	9.9146570E-01	1.0955583E-06	1.6387049E-03	1.8466118E-03	7.9099411E-05
2.5755106E-07	3.4578707E-09	6.3754618E-09	5.3985732E-11			

TEMPERATURE = 2200.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.49834 MOLES OF SOLID = 0.

1.5456293E-07	1.7709988E-04	9.9622860E-01	6.4986076E-09	6.1362847E-04	2.7172042E-03	2.6325830E-04
3.4144627E-09	3.5280154E-08	3.9060451E-10	2.6134043E-10			

TEMPERATURE = 1600.0000 PRESSURE =1000.00000 MOLES OF GAS = 0.49802 MOLES OF SOLID = 0.

1.0962408E-10	1.7086113E-06	9.9640176E-01	2.5213189E-12	8.1084622E-05	2.6642738E-03	8.5102907E-04
2.1098497E-12	1.3575754E-07	1.1510252E-12	1.4170658E-09			

APPENDIX D

OPTICAL CONSTANTS OF THE SILICON-HYDROGEN MIXTURES

Presented on pages D-5 to D-100 are the results for the optical constants of silicon-hydrogen mixtures with Si/H mass ratios of 0., 0.005, 0.01, and 0.05, gas pressures of 100, 500, and 100 atm., and gas temperatures of 1600, 2200, 3000, 4000, 5000, 6500, 8000, and 10,000°K. The arrangement of these 96 cases is given in the index on page D-2, and the computer print-out is arranged so that the cases are in numerical order by case number. The print-out consists of one page for each case, giving the total spectral absorption coefficients for the gas mixtures, and the Planck and Rosseland mean absorption coefficients, as well as other output not specifically requested in this contract. The optical constants for Si/H mass ratio equal to zero, i.e., for hydrogen gas, are included for reference only.

The results are arranged in the following way, with floating point notation used throughout:

The case number is given at the upper right of each page. Across the top of each page appear the equilibrium temperature of the gas mixture ("TEMPERATURE") (°K), the Si/H mass ratio, and the total gas pressure ("PRESSURE") (atm.). Below this are the mid-points of the spectral-averaging intervals*("OMEGA") (cm^{-1}) and the averaged spectral absorption coefficients (cm^{-1}) summed over all molecular band systems and all absorption processes considered ("TOTAL MU") (cm^{-1}), the Planck spectral intensity function, ("B(W, T)" ($erg\text{-}sec^{-1}\text{-}cm^{-2}\text{-}ster^{-1}\text{-}(cm^{-1}(\Delta\omega))^{-1}$), and the spectral volume emission coefficient ("J") ($erg\text{-}sec^{-1}\text{-}cm^{-3}\text{-}ster^{-1}\text{-}(cm^{-1}(\Delta\omega))^{-1}$), which is equal to the product of the "TOTAL MU" and "B(W, T)" columns for each "OMEGA" value. The quantities printed-out from the integration of the total spectral absorption coefficients are:

$J'(T)$ ("J TOTAL") ($erg\text{-}sec^{-1}\text{-}cm^{-3}\text{-}ster^{-1}$)
$\bar{\mu}_P$ ("PLANCK MEAN OPACITY") (cm^{-1})
$\bar{\mu}_P^{(2)}$ ("MEAN-SQUARED PLANCK MEAN OPACITY") (cm^{-2})
Λ_R ("ROSSELAND MEAN-FREE-PATH") (cm)
$\Lambda_R^{(2)}$ ("MEAN-SQUARED ROSSELAND MEAN-FREE-PATH") (cm^2)
$\bar{\mu}_R$ ("1/ROSSELAND MEAN-FREE-PATH") (cm^{-1})
I' ("PRIME") (cm^{-2})

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*For a listing of the correspondence of these "OMEGA" values with the dimensionless frequency interval mid-points specified in the contract, please see the table on pages D-3 and D-4.

INDEX OF OPACITY CASES

Case No's.	Gas Temperature (° K)	Gas Pressure (atm)	Respective Si/H Mass Ratio
1, 2, 3, 4	1600	100	0., 0.005, 0.01, 0.05
5, 6, 7, 8	1600	500	"
9, 10, 11, 12	1600	1000	"
13, 14, 15, 16	2200	100	"
17, 18, 19, 20	2200	500	"
21, 22, 23, 24	2200	1000	"
25, 26, 27, 28	3000	100	"
29, 30, 31, 32	3000	500	"
33, 34, 35, 36	3000	1000	"
37, 38, 39, 40	4000	100	"
41, 42, 43, 44	4000	500	"
45, 46, 47, 48	4000	1000	"
49, 50, 51, 52	5000	100	"
53, 54, 55, 56	5000	500	"
57, 58, 59, 60	5000	1000	"
61, 62, 63, 64	6500	100	"
65, 66, 67, 68	6500	500	"
69, 70, 71, 72	6500	1000	"
73, 74, 75, 76	8000	100	"
77, 78, 79, 80	8000	500	"
81, 82, 83, 84	8000	1000	"
85, 86, 87, 88	10,000	100	"
89, 90, 91, 92	10,000	500	"
93, 94, 95, 96	10,000	1000	"

Correspondence Table of Optical Frequencies

The present computer calculations of the optical constants were to be done for a spectral range defined by a dimensionless frequency, $u = hc\,\omega/5000k = 2.00$ to 19.50, in steps of $\Delta u = 0.50$, where hc/k is the second radiation constant, equal to 1.43879 cm-°K. The OPSAB computer program will only consider spectral ranges of ω, wavenumber (cm^{-1}), and thus we give here a correspondence table for ω and u to aid in interpreting the OPSAB print-out, which gives only the center points of the ω-intervals considered.

Using the value for hc/k, we find

$$\omega = (3.47514 \times 10^3)\, u$$

$$\Delta\omega = (3.47514 \times 10^3)\, \Delta u$$

The intervals of $\Delta u = 0.50$ corresponds to intervals of $\Delta\omega = 1737.57$ cm^{-1}. The calculations of the OPSAB program were carried out for the spectral range $\omega = 6950.28$ cm^{-1} ($u = 2.00$) to $\omega = 69502.80$ cm^{-1} ($u = 20.00$)*; the results printed are for $\omega = 6950.28$ cm^{-1} ($u = 2.00$) to 67765.23 cm^{-1} ($u = 19.50$), with the center-point of each averaging interval of width $\Delta\omega$ (as above) printed in the left-most column ("OMEGA"). These center-points correspond to the points $u = 2.25$ to 19.25 in steps of $\Delta u = 0.50$. We give overleaf the correspondence of the mid-points for the ω- and the u-variables.

*This includes one additional spectral averaging interval at the large frequency end of the spectral range considered. This was added to improve the accuracy of the calculations for band systems of diatomic molecules at this end of the spectrum.

u	$\omega(cm^{-1})$	u	$\omega(cm^{-1})$
2.25	7819.06	11.25	39095.3
2.75	9556.63	11.75	40832.9
3.25	11294.2	12.25	42570.5
3.75	13031.8	12.75	44308.0
4.25	14769.3	13.25	46045.6
4.75	16506.9	13.75	47783.2
5.25	18244.5	14.25	49520.7
5.75	19982.1	14.75	51258.3
6.25	21719.6	15.25	52995.9
6.75	23457.2	15.75	54733.5
7.25	25194.8	16.25	56471.0
7.75	26932.3	16.75	58208.6
8.25	28669.9	17.25	59946.2
8.75	30407.5	17.75	61683.7
9.25	32145.0	18.25	63421.3
9.75	33882.6	18.75	65158.9
10.25	35620.2	19.25	66896.4
10.75	37357.8		

TOTAL OPACITIES AND VOLUME EMISSION 1

TEMPERATURE = 1.60000E+03 SI/H MASS RATIO = 0. PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	4.73691E-39	5.03636E+03	2.38568E-35
9.55663E+03	4.86805E-38	1.92611E+03	9.37638E-35
1.12942E+04	5.00055E-37	6.66323E+02	3.33198E-34
1.30318E+04	5.13616E-36	2.14551E+02	1.10197E-33
1.47693E+04	5.27534E-35	6.54662E+01	3.45357E-33
1.65069E+04	1.30533E-28	1.91578E+01	2.50074E-27
1.82445E+04	9.22131E-28	5.42200E+00	4.99979E-27
1.99821E+04	6.45239E-27	1.49314E+00	9.63433E-27
2.17196E+04	4.49515E-26	4.01933E-01	1.80675E-26
2.34572E+04	2.99271E-25	1.06131E-01	3.17618E-26
2.51948E+04	1.93104E-24	2.75651E-02	5.32292E-26
2.69323E+04	1.18031E-23	7.05776E-03	8.33037E-26
2.86699E+04	6.83746E-23	1.78459E-03	1.22021E-25
3.04075E+04	3.80625E-22	4.46291E-04	1.69869E-25
3.21450E+04	2.04451E-21	1.10518E-04	2.25956E-25
3.38826E+04	1.06113E-20	2.71293E-05	2.87877E-25
3.56202E+04	5.21707E-20	6.60713E-06	3.44699E-25
3.73578E+04	2.34725E-19	1.59765E-06	3.75009E-25
3.90953E+04	9.47886E-19	3.83823E-07	3.63820E-25
4.08329E+04	3.39249E-18	9.16649E-08	3.10973E-25
4.25705E+04	1.07109E-17	2.17728E-08	2.33206E-25
4.43080E+04	3.68751E-17	5.14579E-09	1.89752E-25
4.60456E+04	1.71510E-16	1.21056E-09	2.07623E-25
4.77832E+04	1.10668E-15	2.83571E-10	3.13822E-25
4.95207E+04	9.55844E-15	6.61628E-11	6.32413E-25
5.12583E+04	9.38271E-14	1.53802E-11	1.44308E-24
5.29959E+04	9.53515E-13	3.56296E-12	3.39734E-24
5.47335E+04	9.76446E-12	8.22733E-13	8.03354E-24
5.64710E+04	9.98257E-11	1.89406E-13	1.89076E-23
5.82086E+04	1.28847E-09	4.34804E-14	5.60233E-23
5.99462E+04	1.08583E-08	9.95480E-15	1.08092E-22
6.16837E+04	7.75051E-08	2.27340E-15	1.76200E-22
6.34213E+04	5.91866E-07	5.17948E-16	3.06556E-22
6.51589E+04	2.60107E-06	1.17738E-16	3.06245E-22
6.68964E+04	1.46386E-05	2.67068E-17	3.90949E-22

J TOTAL = 2.39755E-18

PLANCK MEAN OPACITY = 1.73882E-25 MEAN-SQUARED PLANCK MEAN OPACITY = 8.46311E-31

ROSSELAND MEAN-FREE-PATH = 1.25261E+38 1/ROSSELAND MEAN-FREE-PATH = 7.98333E-39

MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 2.53608E+76 I PRIME = 2.09229E+76

TEMPERATURE = 1.60000E+03 SI/H MASS RATIO = 5.00000E-03 PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	2.21920E-04	5.03636E+03	1.11767E+00
9.55663E+03	4.16817E-04	1.92611E+03	8.02833E-01
1.12942E+04	6.66982E-04	6.66323E+02	4.44425E-01
1.30318E+04	9.09687E-04	2.14551E+02	1.95175E-01
1.47693E+04	1.05759E-03	6.54662E+01	6.92367E-02
1.65069E+04	1.04810E-03	1.91578E+01	2.00794E-02
1.82445E+04	8.85417E-04	5.42200E+00	4.80073E-03
1.99821E+04	6.37604E-04	1.49314E+00	9.52033E-04
2.17196E+04	3.91394E-04	4.01933E-01	1.57314E-04
2.34572E+04	2.04805E-04	1.06131E-01	2.17361E-05
2.51948E+04	9.13527E-05	2.75651E-02	2.51815E-06
2.69323E+04	3.47350E-05	7.05776E-03	2.45151E-07
2.86699E+04	1.12583E-05	1.78459E-03	2.00914E-08
3.04075E+04	3.11651E-06	4.46291E-04	1.39087E-09
3.21450E+04	7.32566E-07	1.10518E-04	8.09620E-11
3.38826E+04	1.47070E-07	2.71293E-05	3.98991E-12
3.56202E+04	2.51689E-08	6.60713E-06	1.66294E-13
3.73578E+04	3.67166E-09	1.59765E-06	5.86604E-15
3.90953E+04	4.56583E-10	3.83823E-07	1.75247E-16
4.08329E+04	4.83992E-11	9.16649E-08	4.43651E-18
4.25705E+04	4.42446E-12	2.17728E-08	9.63328E-20
4.43080E+04	4.81752E-12	5.14579E-09	2.47899E-20
4.60456E+04	4.86697E-09	1.21056E-09	5.89174E-18
4.77832E+04	2.12815E-09	2.83571E-10	6.03482E-19
4.95207E+04	3.24324E-10	6.61628E-11	2.14582E-20
5.12583E+04	8.19320E-10	1.53802E-11	1.26013E-20
5.29959E+04	3.38094E-09	3.56296E-12	1.20461E-20
5.47335E+04	3.00158E-11	8.22733E-13	2.46950E-23
5.64710E+04	1.01191E-10	1.89406E-13	1.91662E-23
5.82086E+04	1.28801E-09	4.34804E-14	5.60033E-23
5.99462E+04	1.08544E-08	9.95480E-15	1.08054E-22
6.16837E+04	7.74772E-08	2.27340E-15	1.76137E-22
6.34213E+04	5.91654E-07	5.17948E-16	3.06446E-22
6.51589E+04	2.60013E-06	1.17738E-16	3.06135E-22
6.68964E+04	1.46333E-05	2.67068E-17	3.90808E-22

J TOTAL = 4.61386E+03

PLANCK MEAN OPACITY = 3.34620E-04 MEAN-SQUARED PLANCK MEAN OPACITY = 1.45655E-07
ROSSELAND MEAN-FREE-PATH = 3.42051E+03 1/ROSSELAND MEAN-FREE-PATH = 2.92354E-04
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 8.45865E+11 I PRIME = 5.04257E+12

TEMPERATURE = 1.60000E+03 SI/H MASS RATIO = 1.00000E-02 PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	4.43460E-04	5.03636E+03	2.23343E+00
9.55663E+03	8.32921E-04	1.92611E+03	1.60429E+00
1.12942E+04	1.33282E-03	6.66323E+02	8.88091E-01
1.30318E+04	1.81782E-03	2.14551E+02	3.90016E-01
1.47693E+04	2.11338E-03	6.54662E+01	1.38355E-01
1.65069E+04	2.09442E-03	1.91578E+01	4.01245E-02
1.82445E+04	1.76932E-03	5.42200E+00	9.59326E-03
1.99821E+04	1.27412E-03	1.49314E+00	1.90244E-03
2.17196E+04	7.82120E-04	4.01933E-01	3.14360E-04
2.34572E+04	4.09262E-04	1.06131E-01	4.34353E-05
2.51948E+04	1.82552E-04	2.75651E-02	5.03206E-06
2.69323E+04	6.94123E-05	7.05776E-03	4.89895E-07
2.86699E+04	2.24981E-05	1.78459E-03	4.01500E-08
3.04075E+04	6.23504E-06	4.46291E-04	2.78264E-09
3.21450E+04	1.46392E-06	1.10518E-04	1.61790E-10
3.38826E+04	2.93896E-07	2.71293E-05	7.97322E-12
3.56202E+04	5.02961E-08	6.60713E-06	3.32313E-13
3.73578E+04	7.33724E-09	1.59765E-06	1.17224E-14
3.90953E+04	9.12409E-10	3.83823E-07	3.50204E-16
4.08329E+04	9.67177E-11	9.16649E-08	8.86562E-18
4.25705E+04	8.84151E-12	2.17728E-08	1.92504E-19
4.43080E+04	9.91138E-12	5.14579E-09	5.10018E-20
4.60456E+04	1.91505E-08	1.21056E-09	2.31828E-17
4.77832E+04	4.47870E-09	2.83571E-10	1.27003E-18
4.95207E+04	6.48201E-10	6.61628E-11	4.28868E-20
5.12583E+04	1.63744E-09	1.53802E-11	2.51841E-20
5.29959E+04	6.75636E-09	3.56296E-12	2.40726E-20
5.47335E+04	5.02398E-11	8.22733E-13	4.13339E-23
5.64710E+04	1.02554E-10	1.89406E-13	1.94244E-23
5.82086E+04	1.28755E-09	4.34804E-14	5.59834E-23
5.99462E+04	1.08505E-08	9.95480E-15	1.08015E-22
6.16837E+04	7.74494E-08	2.27340E-15	1.76074E-22
6.34213E+04	5.91441E-07	5.17948E-16	3.06336E-22
6.51589E+04	2.59920E-06	1.17738E-16	3.06025E-22
6.68964E+04	1.46281E-05	2.67068E-17	3.90668E-22

J TOTAL = 9.21984E+03

PLANCK MEAN OPACITY = 6.68668E-04 MEAN-SQUARED PLANCK MEAN OPACITY = 5.81623E-07
ROSSELAND MEAN-FREE-PATH = 1.71171E+03 1/ROSSELAND MEAN-FREE-PATH = 5.84212E-04
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 2.09821E+11 I PRIME = 1.25039E+12

TEMPERATURE = 1.60000E+03 SI/H MASS RATIO = 5.00000E-02 PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	9.09537E-04	5.03636E+03	4.58076E+00
9.55663E+03	1.70832E-03	1.92611E+03	3.29041E+00
1.12942E+04	2.73362E-03	6.66323E+02	1.82147E+00
1.30318E+04	3.72835E-03	2.14551E+02	7.99922E-01
1.47693E+04	4.33455E-03	6.54662E+01	2.83767E-01
1.65069E+04	4.29565E-03	1.91578E+01	8.22954E-02
1.82445E+04	3.62888E-03	5.42200E+00	1.96758E-02
1.99821E+04	2.61323E-03	1.49314E+00	3.90192E-03
2.17196E+04	1.60414E-03	4.01933E-01	6.44757E-04
2.34572E+04	8.39412E-04	1.06131E-01	8.90873E-05
2.51948E+04	3.74429E-04	2.75651E-02	1.03212E-05
2.69323E+04	1.42375E-04	7.05776E-03	1.00485E-06
2.86699E+04	4.61484E-05	1.78459E-03	8.23562E-08
3.04075E+04	1.28203E-05	4.46291E-04	5.72160E-09
3.21450E+04	3.00282E-06	1.10518E-04	3.31867E-10
3.38826E+04	6.02850E-07	2.71293E-05	1.63549E-11
3.56202E+04	1.03170E-07	6.60713E-06	6.81656E-13
3.73578E+04	1.50505E-08	1.59765E-06	2.40454E-14
3.90953E+04	1.87155E-09	3.83823E-07	7.18343E-16
4.08329E+04	1.98385E-10	9.16649E-08	1.81850E-17
4.25705E+04	1.81352E-11	2.17728E-08	3.94853E-19
4.43080E+04	2.15590E-11	5.14579E-09	1.10938E-19
4.60456E+04	8.00357E-08	1.21056E-09	9.68877E-17
4.77832E+04	1.01633E-08	2.83571E-10	2.88200E-18
4.95207E+04	1.32995E-09	6.61628E-11	8.79934E-20
5.12583E+04	3.35956E-09	1.53802E-11	5.16706E-20
5.29959E+04	1.38615E-08	3.56296E-12	4.93880E-20
5.47335E+04	9.28106E-11	8.22733E-13	7.63584E-23
5.64710E+04	1.05425E-10	1.89406E-13	1.99681E-23
5.82086E+04	1.28659E-09	4.34804E-14	5.59415E-23
5.99462E+04	1.08423E-08	9.95480E-15	1.07933E-22
6.16837E+04	7.73910E-08	2.27340E-15	1.75941E-22
6.34213E+04	5.90995E-07	5.17948E-16	3.06105E-22
6.51589E+04	2.59724E-06	1.17738E-16	3.05794E-22
6.68964E+04	1.46170E-05	2.67068E-17	3.90374E-22

J TOTAL = 1.89099E+04

PLANCK MEAN OPACITY = 1.37144E-03 MEAN-SQUARED PLANCK MEAN OPACITY = 2.44666E-06
ROSSELAND MEAN-FREE-PATH = 8.34562E+02 1/ROSSELAND MEAN-FREE-PATH = 1.19823E-03
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 4.89935E+10 I PRIME = 2.91773E+11

TEMPERATURE = 1.60000E+03 SI/H MASS RATIO = 0. PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	2.36846E-38	5.03636E+03	1.19284E-34
9.55663E+03	2.43403E-37	1.92611E+03	4.68820E-34
1.12942E+04	2.50028E-36	6.66323E+02	1.66599E-33
1.30318E+04	2.56809E-35	2.14551E+02	5.50986E-33
1.47693E+04	2.63768E-34	6.54662E+01	1.72679E-32
1.65069E+04	6.52669E-28	1.91578E+01	1.25037E-26
1.82445E+04	4.61067E-27	5.42200E+00	2.49990E-26
1.99821E+04	3.22620E-26	1.49314E+00	4.81718E-26
2.17196E+04	2.24758E-25	4.01933E-01	9.03377E-26
2.34572E+04	1.49636E-24	1.06131E-01	1.58809E-25
2.51948E+04	9.65521E-24	2.75651E-02	2.66147E-25
2.69323E+04	5.90159E-23	7.05776E-03	4.16520E-25
2.86699E+04	3.41874E-22	1.78459E-03	6.10107E-25
3.04075E+04	1.90313E-21	4.46291E-04	8.49350E-25
3.21450E+04	1.02226E-20	1.10518E-04	1.12978E-24
3.38826E+04	5.30566E-20	2.71293E-05	1.43939E-24
3.56202E+04	2.60854E-19	6.60713E-06	1.72350E-24
3.73578E+04	1.17363E-18	1.59765E-06	1.87505E-24
3.90953E+04	4.73944E-18	3.83823E-07	1.81911E-24
4.08329E+04	1.69625E-17	9.16649E-08	1.55487E-24
4.25705E+04	5.35546E-17	2.17728E-08	1.16603E-24
4.43080E+04	1.84376E-16	5.14579E-09	9.48761E-25
4.60456E+04	8.57555E-16	1.21056E-09	1.03812E-24
4.77832E+04	5.53341E-15	2.83571E-10	1.56911E-24
4.95207E+04	4.77924E-14	6.61628E-11	3.16208E-24
5.12583E+04	4.69137E-13	1.53802E-11	7.21541E-24
5.29959E+04	4.76759E-12	3.56296E-12	1.69867E-23
5.47335E+04	4.88224E-11	8.22733E-13	4.01678E-23
5.64710E+04	4.99130E-10	1.89406E-13	9.45381E-23
5.82086E+04	6.44238E-09	4.34804E-14	2.80117E-22
5.99462E+04	5.42918E-08	9.95480E-15	5.40464E-22
6.16837E+04	3.87526E-07	2.27340E-15	8.81004E-22
6.34213E+04	2.95934E-06	5.17948E-16	1.53278E-21
6.51589E+04	1.30054E-05	1.17738E-16	1.53123E-21
6.68964E+04	7.31930E-05	2.67068E-17	1.95475E-21

J TOTAL = 1.19878E-17

PLANCK MEAN OPACITY = 8.69412E-25 MEAN-SQUARED PLANCK MEAN OPACITY = 2.11579E-29
ROSSELAND MEAN-FREE-PATH = 2.50521E+37 1/ROSSELAND MEAN-FREE-PATH = 3.99168E-38
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.01443E+75 I PRIME = 8.36911E+74

TEMPERATURE = 1.60000E+03 SI/H MASS RATIO = 5.00000E-03 PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	4.67792E-04	5.03636E+03	2.35597E+00
9.55663E+03	8.78622E-04	1.92611E+03	1.69232E+00
1.12942E+04	1.40595E-03	6.66323E+02	9.36819E-01
1.30318E+04	1.91756E-03	2.14551E+02	4.11415E-01
1.47693E+04	2.22934E-03	6.54662E+01	1.45946E-01
1.65069E+04	2.20933E-03	1.91578E+01	4.23260E-02
1.82445E+04	1.86640E-03	5.42200E+00	1.01196E-02
1.99821E+04	1.34403E-03	1.49314E+00	2.00682E-03
2.17196E+04	8.25031E-04	4.01933E-01	3.31607E-04
2.34572E+04	4.31712E-04	1.06131E-01	4.58179E-05
2.51948E+04	1.92564E-04	2.75651E-02	5.30804E-06
2.69323E+04	7.32178E-05	7.05776E-03	5.16753E-07
2.86699E+04	2.37311E-05	1.78459E-03	4.23504E-08
3.04075E+04	6.55953E-06	4.46291E-04	2.92745E-09
3.21450E+04	1.54418E-06	1.10518E-04	1.70660E-10
3.38826E+04	3.10011E-07	2.71293E-05	8.41040E-12
3.56202E+04	5.30538E-08	6.60713E-06	3.50534E-13
3.73578E+04	7.73954E-09	1.59765E-06	1.23651E-14
3.90953E+04	9.62440E-10	3.83823E-07	3.69407E-16
4.08329E+04	1.02022E-10	9.16649E-08	9.35180E-18
4.25705E+04	9.26691E-12	2.17728E-08	2.01766E-19
4.43080E+04	4.82574E-12	5.14579E-09	2.48322E-20
4.60456E+04	9.79203E-10	1.21056E-09	1.18538E-18
4.77832E+04	1.91993E-09	2.83571E-10	5.44437E-19
4.95207E+04	3.05778E-10	6.61628E-11	2.02311E-20
5.12583E+04	7.72750E-10	1.53802E-11	1.18850E-20
5.29959E+04	3.19106E-09	3.56296E-12	1.13696E-20
5.47335E+04	6.78990E-11	8.22733E-13	5.58628E-23
5.64710E+04	5.00271E-10	1.89406E-13	9.47543E-23
5.82086E+04	6.44007E-09	4.34804E-14	2.80017E-22
5.99462E+04	5.42723E-08	9.95480E-15	5.40270E-22
6.16837E+04	3.87387E-07	2.27340E-15	8.80687E-22
6.34213E+04	2.95828E-06	5.17948E-16	1.53223E-21
6.51589E+04	1.30007E-05	1.17738E-16	1.53068E-21
6.68964E+04	7.31667E-05	2.67068E-17	1.95405E-21

J TOTAL = 9.72571E+03

PLANCK MEAN OPACITY = 7.05357E-04 MEAN-SQUARED PLANCK MEAN OPACITY = 6.47200E-07
ROSSELAND MEAN-FREE-PATH = 1.62305E+03 1/ROSSELAND MEAN-FREE-PATH = 6.16124E-04
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 3.01290E+11 I PRIME = 1.82006E+12

TEMPERATURE = 1.60000E+03 SI/H MASS RATIO = 1.00000E-02 PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	9.35465E-04	5.03636E+03	4.71134E+00
9.55663E+03	1.75702E-03	1.92611E+03	3.38421E+00
1.12942E+04	2.81155E-03	6.66323E+02	1.87340E+00
1.30318E+04	3.83463E-03	2.14551E+02	8.22725E-01
1.47693E+04	4.45811E-03	6.54662E+01	2.91856E-01
1.65069E+04	4.41810E-03	1.91578E+01	8.46412E-02
1.82445E+04	3.73232E-03	5.42200E+00	2.02367E-02
1.99821E+04	2.68771E-03	1.49314E+00	4.01313E-03
2.17196E+04	1.64985E-03	4.01933E-01	6.63130E-04
2.34572E+04	8.63315E-04	1.06131E-01	9.16242E-05
2.51948E+04	3.85079E-04	2.75651E-02	1.06147E-05
2.69323E+04	1.46417E-04	7.05776E-03	1.03338E-06
2.86699E+04	4.74563E-05	1.78459E-03	8.46901E-08
3.04075E+04	1.31187E-05	4.46291E-04	5.85474E-09
3.21450E+04	3.08797E-06	1.10518E-04	3.41278E-10
3.38826E+04	6.19944E-07	2.71293E-05	1.68187E-11
3.56202E+04	1.06094E-07	6.60713E-06	7.00978E-13
3.73578E+04	1.54771E-08	1.59765E-06	2.47271E-14
3.90953E+04	1.92464E-09	3.83823E-07	7.38720E-16
4.08329E+04	2.04017E-10	9.16649E-08	1.87012E-17
4.25705E+04	1.85314E-11	2.17728E-08	4.03481E-19
4.43080E+04	9.70195E-12	5.14579E-09	4.99242E-20
4.60456E+04	3.63698E-09	1.21056E-09	4.40277E-18
4.77832E+04	3.88019E-09	2.83571E-10	1.10031E-18
4.95207E+04	6.11540E-10	6.61628E-11	4.04612E-20
5.12583E+04	1.54511E-09	1.53802E-11	2.37641E-20
5.29959E+04	6.37768E-09	3.56296E-12	2.27234E-20
5.47335E+04	8.69776E-11	8.22733E-13	7.15594E-23
5.64710E+04	5.01413E-10	1.89406E-13	9.49706E-23
5.82086E+04	6.43776E-09	4.34804E-14	2.79917E-22
5.99462E+04	5.42528E-08	9.95480E-15	5.40076E-22
6.16837E+04	3.87248E-07	2.27340E-15	8.80371E-22
6.34213E+04	2.95722E-06	5.17948E-16	1.53168E-21
6.51589E+04	1.29960E-05	1.17738E-16	1.53013E-21
6.68964E+04	7.31405E-05	2.67068E-17	1.95335E-21

J TOTAL = 1.94489E+04

PLANCK MEAN OPACITY = 1.41053E-03 MEAN-SQUARED PLANCK MEAN OPACITY = 2.58814E-06
ROSSELAND MEAN-FREE-PATH = 8.11626E+02 1/ROSSELAND MEAN-FREE-PATH = 1.23209E-03
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 7.49676E+10 I PRIME = 4.52818E+11

TEMPERATURE = 1.60000E+03 SI/H MASS RATIO = 5.00000E-02 PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	4.53856E-03	5.03636E+03	2.28579E+01
9.55663E+03	8.52447E-03	1.92611E+03	1.64190E+01
1.12942E+04	1.36407E-02	6.66323E+02	9.08910E+00
1.30318E+04	1.86044E-02	2.14551E+02	3.99159E+00
1.47693E+04	2.16293E-02	6.54662E+01	1.41599E+00
1.65069E+04	2.14351E-02	1.91578E+01	4.10651E-01
1.82445E+04	1.81080E-02	5.42200E+00	9.81815E-02
1.99821E+04	1.30399E-02	1.49314E+00	1.94704E-02
2.17196E+04	8.00455E-03	4.01933E-01	3.21729E-03
2.34572E+04	4.18853E-03	1.06131E-01	4.44532E-04
2.51948E+04	1.86829E-03	2.75651E-02	5.14997E-05
2.69323E+04	7.10381E-04	7.05776E-03	5.01370E-06
2.86699E+04	2.30249E-04	1.78459E-03	4.10900E-07
3.04075E+04	6.36972E-05	4.46291E-04	2.84274E-08
3.21450E+04	1.49822E-05	1.10518E-04	1.65581E-09
3.38826E+04	3.00785E-06	2.71293E-05	8.16009E-11
3.56202E+04	5.14749E-07	6.60713E-06	3.40102E-12
3.73578E+04	7.50920E-08	1.59765E-06	1.19971E-13
3.90953E+04	9.33794E-09	3.83823E-07	3.58412E-15
4.08329E+04	9.89845E-10	9.16649E-08	9.07341E-17
4.25705E+04	8.99103E-11	2.17728E-08	1.95760E-18
4.43080E+04	4.90212E-11	5.14579E-09	2.52253E-19
4.60456E+04	8.07909E-08	1.21056E-09	9.78020E-17
4.77832E+04	2.03603E-08	2.83571E-10	5.77360E-18
4.95207E+04	2.97091E-09	6.61628E-11	1.96564E-19
5.12583E+04	7.50492E-09	1.53802E-11	1.15427E-19
5.29959E+04	3.09668E-08	3.56296E-12	1.10333E-19
5.47335E+04	2.34195E-10	8.22733E-13	1.92680E-22
5.64710E+04	5.10229E-10	1.89406E-13	9.66404E-23
5.82086E+04	6.42001E-09	4.34804E-14	2.79145E-22
5.99462E+04	5.41030E-08	9.95480E-15	5.38584E-22
6.16837E+04	3.86179E-07	2.27340E-15	8.77940E-22
6.34213E+04	2.94905E-06	5.17948E-16	1.52745E-21
6.51589E+04	1.29601E-05	1.17738E-16	1.52590E-21
6.68964E+04	7.29385E-05	2.67068E-17	1.94795E-21

J TOTAL = 9.43598E+04

PLANCK MEAN OPACITY = 6.84343E-03 MEAN-SQUARED PLANCK MEAN OPACITY = 6.09213E-05
ROSSELAND MEAN-FREE-PATH = 1.67285E+02 1/ROSSELAND MEAN-FREE-PATH = 5.97781E-03
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 3.06943E+09 I PRIME = 1.85236E+10

TEMPERATURE = 1.60000E+03 SI/H MASS RATIO = 0. PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	4.73692E-38	5.03636E+03	2.38569E-34
9.55663E+03	4.86807E-37	1.92611E+03	9.37642E-34
1.12942E+04	5.00057E-36	6.66323E+02	3.33199E-33
1.30318E+04	5.13618E-35	2.14551E+02	1.10197E-32
1.47693E+04	5.27536E-34	6.54662E+01	3.45358E-32
1.65069E+04	1.30534E-27	1.91578E+01	2.50075E-26
1.82445E+04	9.22134E-27	5.42200E+00	4.99981E-26
1.99821E+04	6.45241E-26	1.49314E+00	9.63437E-26
2.17196E+04	4.49517E-25	4.01933E-01	1.80676E-25
2.34572E+04	2.99272E-24	1.06131E-01	3.17619E-25
2.51948E+04	1.93104E-23	2.75651E-02	5.32294E-25
2.69323E+04	1.18032E-22	7.05776E-03	8.33040E-25
2.86699E+04	6.83749E-22	1.78459E-03	1.22021E-24
3.04075E+04	3.80627E-21	4.46291E-04	1.69870E-24
3.21450E+04	2.04451E-20	1.10518E-04	2.25956E-24
3.38826E+04	1.06113E-19	2.71293E-05	2.87879E-24
3.56202E+04	5.21709E-19	6.60713E-06	3.44700E-24
3.73578E+04	2.34726E-18	1.59765E-06	3.75011E-24
3.90953E+04	9.47889E-18	3.83823E-07	3.63822E-24
4.08329E+04	3.39251E-17	9.16649E-08	3.10974E-24
4.25705E+04	1.07109E-16	2.17728E-08	2.33206E-24
4.43080E+04	3.68753E-16	5.14579E-09	1.89752E-24
4.60456E+04	1.71511E-15	1.21056E-09	2.07624E-24
4.77832E+04	1.10668E-14	2.83571E-10	3.13823E-24
4.95207E+04	9.55848E-14	6.61628E-11	6.32416E-24
5.12583E+04	9.38274E-13	1.53802E-11	1.44308E-23
5.29959E+04	9.53519E-12	3.56296E-12	3.39735E-23
5.47335E+04	9.76449E-11	8.22733E-13	8.03357E-23
5.64710E+04	9.98260E-10	1.89406E-13	1.89076E-22
5.82086E+04	1.28848E-08	4.34804E-14	5.60235E-22
5.99462E+04	1.08584E-07	9.95480E-15	1.08093E-21
6.16837E+04	7.75053E-07	2.27340E-15	1.76201E-21
6.34213E+04	5.91868E-06	5.17948E-16	3.06557E-21
6.51589E+04	2.60108E-05	1.17738E-16	3.06246E-21
6.68964E+04	1.46386E-04	2.67068E-17	3.90950E-21

J TOTAL = 2.39756E-17

PLANCK MEAN OPACITY = 1.73883E-24 MEAN-SQUARED PLANCK MEAN OPACITY = 8.46317E-29
ROSSELAND MEAN-FREE-PATH = 1.25261E+37 1/ROSSELAND MEAN-FREE-PATH = 7.98336E-38
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 2.53606E+74 I PRIME = 2.09227E+74

TEMPERATURE = 1.60000E+03 SI/H MASS RATIO = 5.00000E-03 PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	6.22009E-04	5.03636E+03	3.13267E+00
9.55663E+03	1.16828E-03	1.92611E+03	2.25023E+00
1.12942E+04	1.86945E-03	6.66323E+02	1.24566E+00
1.30318E+04	2.54972E-03	2.14551E+02	5.47046E-01
1.47693E+04	2.96429E-03	6.54662E+01	1.94061E-01
1.65069E+04	2.93768E-03	1.91578E+01	5.62797E-02
1.82445E+04	2.48170E-03	5.42200E+00	1.34558E-02
1.99821E+04	1.78711E-03	1.49314E+00	2.66841E-03
2.17196E+04	1.09702E-03	4.01933E-01	4.40928E-04
2.34572E+04	5.74034E-04	1.06131E-01	6.09227E-05
2.51948E+04	2.56046E-04	2.75651E-02	7.05794E-06
2.69323E+04	9.73554E-05	7.05776E-03	6.87111E-07
2.86699E+04	3.15545E-05	1.78459E-03	5.63119E-08
3.04075E+04	8.72054E-06	4.46291E-04	3.89189E-09
3.21450E+04	2.05325E-06	1.10518E-04	2.26922E-10
3.38826E+04	4.12212E-07	2.71293E-05	1.11831E-11
3.56202E+04	7.05440E-08	6.60713E-06	4.66094E-13
3.73578E+04	1.02910E-08	1.59765E-06	1.64415E-14
3.90953E+04	1.27973E-09	3.83823E-07	4.91189E-16
4.08329E+04	1.35655E-10	9.16649E-08	1.24348E-17
4.25705E+04	1.23032E-11	2.17728E-08	2.67875E-19
4.43080E+04	4.80144E-12	5.14579E-09	2.47072E-20
4.60456E+04	5.02930E-10	1.21056E-09	6.08825E-19
4.77832E+04	1.79518E-09	2.83571E-10	5.09060E-19
4.95207E+04	2.87549E-10	6.61628E-11	1.90250E-20
5.12583E+04	7.27051E-10	1.53802E-11	1.11822E-20
5.29959E+04	3.00535E-09	3.56296E-12	1.07079E-20
5.47335E+04	1.15563E-10	8.22733E-13	9.50771E-23
5.64710E+04	9.99144E-10	1.89406E-13	1.89244E-22
5.82086E+04	1.28801E-08	4.34804E-14	5.60034E-22
5.99462E+04	1.08545E-07	9.95480E-15	1.08054E-21
6.16837E+04	7.74775E-07	2.27340E-15	1.76138E-21
6.34213E+04	5.91656E-06	5.17948E-16	3.06447E-21
6.51589E+04	2.60014E-05	1.17738E-16	3.06136E-21
6.68964E+04	1.46334E-04	2.67068E-17	3.90810E-21

J TOTAL = 1.29320E+04

PLANCK MEAN OPACITY = 9.37892E-04 MEAN-SQUARED PLANCK MEAN OPACITY = 1.14426E-06
ROSSELAND MEAN-FREE-PATH = 1.22082E+03 1/ROSSELAND MEAN-FREE-PATH = 8.19125E-04
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 2.33240E+11 I PRIME = 1.41776E+12

TEMPERATURE = 1.60000E+03 SI/H MASS RATIO = 1.00000E-02 PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.24345E-03	5.03636E+03	6.26245E+00
9.55663E+03	2.33548E-03	1.92611E+03	4.49838E+00
1.12942E+04	3.73719E-03	6.66323E+02	2.49017E+00
1.30318E+04	5.09710E-03	2.14551E+02	1.09359E+00
1.47693E+04	5.92585E-03	6.54662E+01	3.87943E-01
1.65069E+04	5.87266E-03	1.91578E+01	1.12508E-01
1.82445E+04	4.96111E-03	5.42200E+00	2.68991E-02
1.99821E+04	3.57258E-03	1.49314E+00	5.33437E-03
2.17196E+04	2.19303E-03	4.01933E-01	8.81451E-04
2.34572E+04	1.14754E-03	1.06131E-01	1.21789E-04
2.51948E+04	5.11857E-04	2.75651E-02	1.41094E-05
2.69323E+04	1.94621E-04	7.05776E-03	1.37359E-06
2.86699E+04	6.30800E-05	1.78459E-03	1.12572E-07
3.04075E+04	1.74336E-05	4.46291E-04	7.78046E-09
3.21450E+04	4.10461E-06	1.10518E-04	4.53635E-10
3.38826E+04	8.24046E-07	2.71293E-05	2.23558E-11
3.56202E+04	1.41023E-07	6.60713E-06	9.31759E-13
3.73578E+04	2.05726E-08	1.59765E-06	3.28679E-14
3.90953E+04	2.55828E-09	3.83823E-07	9.81926E-16
4.08329E+04	2.71185E-10	9.16649E-08	2.48582E-17
4.25705E+04	2.45950E-11	2.17728E-08	5.35502E-19
4.43080E+04	9.62174E-12	5.14579E-09	4.95114E-20
4.60456E+04	1.74673E-09	1.21056E-09	2.11452E-18
4.77832E+04	3.60705E-09	2.83571E-10	1.02286E-18
4.95207E+04	5.74841E-10	6.61628E-11	3.80331E-20
5.12583E+04	1.45276E-09	1.53802E-11	2.23436E-20
5.29959E+04	5.99948E-09	3.56296E-12	2.13759E-20
5.47335E+04	1.33470E-10	8.22733E-13	1.09810E-22
5.64710E+04	1.00003E-09	1.89406E-13	1.89411E-22
5.82086E+04	1.28755E-08	4.34804E-14	5.59833E-22
5.99462E+04	1.08506E-07	9.95480E-15	1.08015E-21
6.16837E+04	7.74497E-07	2.27340E-15	1.76074E-21
6.34213E+04	5.91443E-06	5.17948E-16	3.06337E-21
6.51589E+04	2.59921E-05	1.17738E-16	3.06026E-21
6.68964E+04	1.46281E-04	2.67068E-17	3.90670E-21

J TOTAL = 2.58521E+04

PLANCK MEAN OPACITY = 1.87492E-03 MEAN-SQUARED PLANCK MEAN OPACITY = 4.57285E-06
ROSSELAND MEAN-FREE-PATH = 6.10687E+02 1/ROSSELAND MEAN-FREE-PATH = 1.63750E-03
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 5.81915E+10 I PRIME = 3.53702E+11

TEMPERATURE = 1.60000E+03 SI/H MASS RATIO = 5.00000E-02 PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	6.23988E-03	5.03636E+03	3.14263E+01
9.55663E+03	1.17199E-02	1.92611E+03	2.25739E+01
1.12942E+04	1.87540E-02	6.66323E+02	1.24962E+01
1.30318E+04	2.55784E-02	2.14551E+02	5.48787E+00
1.47693E+04	2.97372E-02	6.54662E+01	1.94678E+00
1.65069E+04	2.94703E-02	1.91578E+01	5.64587E-01
1.82445E+04	2.48959E-02	5.42200E+00	1.34986E-01
1.99821E+04	1.79280E-02	1.49314E+00	2.67690E-02
2.17196E+04	1.10051E-02	4.01933E-01	4.42331E-03
2.34572E+04	5.75862E-03	1.06131E-01	6.11166E-04
2.51948E+04	2.56862E-03	2.75651E-02	7.08042E-05
2.69323E+04	9.76658E-04	7.05776E-03	6.89301E-06
2.86699E+04	3.16552E-04	1.78459E-03	5.64916E-07
3.04075E+04	8.75092E-05	4.46291E-04	3.90545E-08
3.21450E+04	2.05980E-05	1.10518E-04	2.27646E-09
3.38826E+04	4.13527E-06	2.71293E-05	1.12187E-10
3.56202E+04	7.07690E-07	6.60713E-06	4.67580E-12
3.73578E+04	1.03239E-07	1.59765E-06	1.64940E-13
3.90953E+04	1.28381E-08	3.83823E-07	4.92755E-15
4.08329E+04	1.36087E-09	9.16649E-08	1.24744E-16
4.25705E+04	1.23424E-10	2.17728E-08	2.68728E-18
4.43080E+04	4.92423E-11	5.14579E-09	2.53390E-19
4.60456E+04	3.88707E-08	1.21056E-09	4.70552E-17
4.77832E+04	1.88464E-08	2.83571E-10	5.34430E-18
4.95207E+04	2.88845E-09	6.61628E-11	1.91108E-19
5.12583E+04	7.29699E-09	1.53802E-11	1.12229E-19
5.29959E+04	3.01117E-08	3.56296E-12	1.07287E-19
5.47335E+04	2.77684E-10	8.22733E-13	2.28460E-22
5.64710E+04	1.00715E-09	1.89406E-13	1.90760E-22
5.82086E+04	1.28385E-08	4.34804E-14	5.58222E-22
5.99462E+04	1.08193E-07	9.95480E-15	1.07704E-21
6.16837E+04	7.72266E-07	2.27340E-15	1.75567E-21
6.34213E+04	5.89740E-06	5.17948E-16	3.05454E-21
6.51589E+04	2.59172E-05	1.17738E-16	3.05145E-21
6.68964E+04	1.45860E-04	2.67068E-17	3.89544E-21

J TOTAL = 1.29731E+05

PLANCK MEAN OPACITY = 9.40876E-03 MEAN-SQUARED PLANCK MEAN OPACITY = 1.15156E-04
ROSSELAND MEAN-FREE-PATH = 1.21693E+02 1/ROSSELAND MEAN-FREE-PATH = 8.21742E-03
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 2.25660E+09 I PRIME = 1.37105E+10

TEMPERATURE = 2.20000E+03 SI/H MASS RATIO = 0. PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.70164E-27	3.44477E+04	5.86177E-23
9.55663E+03	9.29371E-27	2.01055E+04	1.86855E-22
1.12942E+04	5.06313E-26	1.06385E+04	5.38642E-22
1.30318E+04	2.75613E-25	5.24356E+03	1.44520E-21
1.47693E+04	1.49992E-24	2.44977E+03	3.67447E-21
1.65069E+04	3.60842E-20	1.09775E+03	3.96115E-17
1.82445E+04	1.69537E-19	4.75752E+02	8.06575E-17
1.99821E+04	7.77610E-19	2.00626E+02	1.56009E-16
2.17196E+04	3.49966E-18	8.27006E+01	2.89424E-16
2.34572E+04	1.49026E-17	3.34398E+01	4.98341E-16
2.51948E+04	6.13690E-17	1.33000E+01	8.16207E-16
2.69323E+04	2.39021E-16	5.21466E+00	1.24641E-15
2.86699E+04	8.79798E-16	2.01914E+00	1.77644E-15
3.04075E+04	3.11729E-15	7.73240E-01	2.41041E-15
3.21450E+04	1.06966E-14	2.93224E-01	3.13651E-15
3.38826E+04	3.57581E-14	1.10223E-01	3.94137E-15
3.56202E+04	1.14378E-13	4.11069E-02	4.70171E-15
3.73578E+04	3.40397E-13	1.52213E-02	5.18129E-15
3.90953E+04	9.28477E-13	5.59976E-03	5.19925E-15
4.08329E+04	2.33274E-12	2.04790E-03	4.77722E-15
4.25705E+04	5.42594E-12	7.44884E-04	4.04169E-15
4.43080E+04	1.42903E-11	2.69585E-04	3.85245E-15
4.60456E+04	4.73798E-11	9.71173E-05	4.60140E-15
4.77832E+04	1.96310E-10	3.48371E-05	6.83886E-15
4.95207E+04	1.05097E-09	1.24469E-05	1.30814E-14
5.12583E+04	5.44531E-09	4.43076E-06	2.41268E-14
5.29959E+04	2.91802E-08	1.57180E-06	4.58652E-14
5.47335E+04	1.57672E-07	5.55792E-07	8.76331E-14
5.64710E+04	8.55052E-07	1.95937E-07	1.67536E-13
5.82086E+04	5.31174E-06	6.88786E-08	3.65865E-13
5.99462E+04	2.52732E-05	2.41486E-08	6.10310E-13
6.16837E+04	9.89260E-05	8.44507E-09	8.35437E-13
6.34213E+04	3.41750E-04	2.94633E-09	1.00691E-12
6.51589E+04	1.20744E-03	1.02561E-09	1.23836E-12
6.68964E+04	2.80338E-03	3.56249E-10	9.98700E-13

J TOTAL = 9.46526E-09

PLANCK MEAN OPACITY = 7.28291E-17 MEAN-SQUARED PLANCK MEAN OPACITY = 6.33616E-20
ROSSELAND MEAN-FREE-PATH = 2.52843E+26 1/ROSSELAND MEAN-FREE-PATH = 3.95503E-27
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.32731E+53 I PRIME = 9.06468E+52

TEMPERATURE = 2.20000E+03 SI/H MASS RATIO = 5.00000E-03 PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.04999E-03	3.44477E+04	3.61697E+01
9.55663E+03	1.68987E-03	2.01055E+04	3.39757E+01
1.12942E+04	2.40634E-03	1.06385E+04	2.55999E+01
1.30318E+04	3.03751E-03	5.24356E+03	1.59274E+01
1.47693E+04	3.40093E-03	2.44977E+03	8.33150E+00
1.65069E+04	3.37818E-03	1.09775E+03	3.70841E+00
1.82445E+04	2.97715E-03	4.75752E+02	1.41638E+00
1.99821E+04	2.32790E-03	2.00626E+02	4.67038E-01
2.17196E+04	1.61501E-03	8.27006E+01	1.33562E-01
2.34572E+04	9.96754E-04	3.34398E+01	3.33313E-02
2.51948E+04	5.43205E-04	1.33000E+01	7.22461E-03
2.69323E+04	2.63279E-04	5.21466E+00	1.37291E-03
2.86699E+04	1.13226E-04	2.01914E+00	2.28620E-04
3.04075E+04	4.77888E-05	7.73240E-01	3.69522E-05
3.21450E+04	1.46021E-05	2.93224E-01	4.28168E-06
3.38826E+04	4.38345E-06	1.10223E-01	4.83157E-07
3.56202E+04	1.16779E-06	4.11069E-02	4.80042E-08
3.73578E+04	2.76033E-07	1.52213E-02	4.20159E-09
3.90953E+04	5.78903E-08	5.59976E-03	3.24172E-10
4.08329E+04	1.07750E-08	2.04790E-03	2.20662E-11
4.25705E+04	2.11499E-09	7.44884E-04	1.57542E-12
4.43080E+04	1.78513E-08	2.69585E-04	4.81244E-12
4.60456E+04	2.65136E-06	9.71173E-05	2.57493E-10
4.77832E+04	2.19366E-06	3.48371E-05	7.64208E-11
4.95207E+04	6.75775E-07	1.24469E-05	8.41133E-12
5.12583E+04	1.24450E-06	4.43076E-06	5.51409E-12
5.29959E+04	4.09934E-06	1.57180E-06	6.44333E-12
5.47335E+04	1.83220E-07	5.55792E-07	1.01833E-13
5.64710E+04	8.56367E-07	1.95937E-07	1.67794E-13
5.82086E+04	5.30984E-06	6.88786E-08	3.65734E-13
5.99462E+04	2.52641E-05	2.41486E-08	6.10091E-13
6.16837E+04	9.88905E-05	8.44507E-09	8.35137E-13
6.34213E+04	3.41627E-04	2.94633E-09	1.00655E-12
6.51589E+04	1.20701E-03	1.02561E-09	1.23792E-12
6.68964E+04	2.80237E-03	3.56249E-10	9.98341E-13

J TOTAL = 2.18537E+05

PLANCK MEAN OPACITY = 1.68151E-03 MEAN-SQUARED PLANCK MEAN OPACITY = 3.36636E-06
ROSSELAND MEAN-FREE-PATH = 6.93947E+02 1/ROSSELAND MEAN-FREE-PATH = 1.44103E-03
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.09678E+10 I PRIME = 6.01608E+10

TEMPERATURE = 2.20000E+03 SI/H MASS RATIO = 1.00000E-02 PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	2.09786E-03	3.44477E+04	7.22664E+01
9.55663E+03	3.37634E-03	2.01055E+04	6.78830E+01
1.12942E+04	4.80783E-03	1.06385E+04	5.11482E+01
1.30318E+04	6.06890E-03	5.24356E+03	3.18227E+01
1.47693E+04	6.79502E-03	2.44977E+03	1.66462E+01
1.65069E+04	6.74959E-03	1.09775E+03	7.40939E+00
1.82445E+04	5.94838E-03	4.75752E+02	2.82995E+00
1.99821E+04	4.65125E-03	2.00626E+02	9.33164E-01
2.17196E+04	3.22699E-03	8.27006E+01	2.66874E-01
2.34572E+04	1.99197E-03	3.34398E+01	6.66112E-02
2.51948E+04	1.08606E-03	1.33000E+01	1.44445E-02
2.69323E+04	5.26547E-04	5.21466E+00	2.74577E-03
2.86699E+04	2.26450E-04	2.01914E+00	4.57235E-04
3.04075E+04	9.90481E-05	7.73240E-01	7.65879E-05
3.21450E+04	2.91832E-05	2.93224E-01	8.55722E-06
3.38826E+04	8.76009E-06	1.10223E-01	9.65564E-07
3.56202E+04	2.33381E-06	4.11069E-02	9.59355E-08
3.73578E+04	5.51650E-07	1.52213E-02	8.39684E-09
3.90953E+04	1.15691E-07	5.59976E-03	6.47843E-10
4.08329E+04	2.15307E-08	2.04790E-03	4.40929E-11
4.25705E+04	4.22110E-09	7.44884E-04	3.14423E-12
4.43080E+04	3.66730E-08	2.69585E-04	9.88648E-12
4.60456E+04	9.95184E-06	9.71173E-05	9.66497E-10
4.77832E+04	4.47679E-06	3.48371E-05	1.55958E-10
4.95207E+04	1.34938E-06	1.24469E-05	1.67957E-11
5.12583E+04	2.48150E-06	4.43076E-06	1.09949E-11
5.29959E+04	8.16276E-06	1.57180E-06	1.28302E-11
5.47335E+04	2.08726E-07	5.55792E-07	1.16009E-13
5.64710E+04	8.57680E-07	1.95937E-07	1.68051E-13
5.82086E+04	5.30794E-06	6.88786E-08	3.65603E-13
5.99462E+04	2.52550E-05	2.41486E-08	6.09872E-13
6.16837E+04	9.88550E-05	8.44507E-09	8.34838E-13
6.34213E+04	3.41505E-04	2.94633E-09	1.00619E-12
6.51589E+04	1.20658E-03	1.02561E-09	1.23747E-12
6.68964E+04	2.80136E-03	3.56249E-10	9.97983E-13

J TOTAL = 4.36634E+05

PLANCK MEAN OPACITY = 3.35962E-03 MEAN-SQUARED PLANCK MEAN OPACITY = 1.34383E-05
ROSSELAND MEAN-FREE-PATH = 3.47306E+02 1/ROSSELAND MEAN-FREE-PATH = 2.87931E-03
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 2.75211E+09 I PRIME = 1.50958E+10

TEMPERATURE = 2.20000E+03 SI/H MASS RATIO = 5.00000E-02 PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.05078E-02	3.44477E+04	3.61970E+02
9.55663E+03	1.69116E-02	2.01055E+04	3.40015E+02
1.12942E+04	2.40819E-02	1.06385E+04	2.56196E+02
1.30318E+04	3.03991E-02	5.24356E+03	1.59399E+02
1.47693E+04	3.40376E-02	2.44977E+03	8.33842E+01
1.65069E+04	3.38128E-02	1.09775E+03	3.71181E+01
1.82445E+04	2.98038E-02	4.75752E+02	1.41792E+01
1.99821E+04	2.33125E-02	2.00626E+02	4.67710E+00
2.17196E+04	1.61832E-02	8.27006E+01	1.33836E+00
2.34572E+04	1.00074E-02	3.34398E+01	3.34644E-01
2.51948E+04	5.47881E-03	1.33000E+01	7.28681E-02
2.69323E+04	2.66463E-03	5.21466E+00	1.38952E-02
2.86699E+04	1.14697E-03	2.01914E+00	2.31590E-03
3.04075E+04	6.42195E-04	7.73240E-01	4.96571E-04
3.21450E+04	1.47237E-04	2.93224E-01	4.31734E-05
3.38826E+04	4.42066E-05	1.10223E-01	4.87259E-06
3.56202E+04	1.17841E-05	4.11069E-02	4.84408E-07
3.73578E+04	2.78586E-06	1.52213E-02	4.24045E-08
3.90953E+04	5.84061E-07	5.59976E-03	3.27060E-09
4.08329E+04	1.08610E-07	2.04790E-03	2.22422E-10
4.25705E+04	2.12356E-08	7.44884E-04	1.58181E-11
4.43080E+04	2.24935E-07	2.69585E-04	6.06390E-11
4.60456E+04	2.38171E-04	9.71173E-05	2.31305E-08
4.77832E+04	2.62292E-05	3.48371E-05	9.13749E-10
4.95207E+04	6.76432E-06	1.24469E-05	8.41950E-11
5.12583E+04	1.24254E-05	4.43076E-06	5.50541E-11
5.29959E+04	4.08275E-05	1.57180E-06	6.41724E-11
5.47335E+04	4.13762E-07	5.55792E-07	2.29966E-13
5.64710E+04	8.68240E-07	1.95937E-07	1.70120E-13
5.82086E+04	5.29274E-06	6.88786E-08	3.64556E-13
5.99462E+04	2.51824E-05	2.41486E-08	6.08118E-13
6.16837E+04	9.85706E-05	8.44507E-09	8.32436E-13
6.34213E+04	3.40523E-04	2.94633E-09	1.00329E-12
6.51589E+04	1.20310E-03	1.02561E-09	1.23391E-12
6.68964E+04	2.79331E-03	3.56249E-10	9.95112E-13

J TOTAL = 2.18708E+06

PLANCK MEAN OPACITY = 1.68282E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 3.37170E-04
ROSSELAND MEAN-FREE-PATH = 6.92779E+01 1/ROSSELAND MEAN-FREE-PATH = 1.44346E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.08521E+08 I PRIME = 5.95230E+08

TEMPERATURE = 2.20000E+03 SI/H MASS RATIO = 0. PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	8.51086E-27	3.44477E+04	2.93180E-22
9.55663E+03	4.64830E-26	2.01055E+04	9.34563E-22
1.12942E+04	2.53235E-25	1.06385E+04	2.69405E-21
1.30318E+04	1.37849E-24	5.24356E+03	7.22822E-21
1.47693E+04	7.50195E-24	2.44977E+03	1.83780E-20
1.65069E+04	1.80477E-19	1.09775E+03	1.98119E-16
1.82445E+04	8.47949E-19	4.75752E+02	4.03413E-16
1.99821E+04	3.88926E-18	2.00626E+02	7.80288E-16
2.17196E+04	1.75037E-17	8.27006E+01	1.44757E-15
2.34572E+04	7.45363E-17	3.34398E+01	2.49248E-15
2.51948E+04	3.06940E-16	1.33000E+01	4.08230E-15
2.69323E+04	1.19548E-15	5.21466E+00	6.23400E-15
2.86699E+04	4.40035E-15	2.01914E+00	8.88495E-15
3.04075E+04	1.55913E-14	7.73240E-01	1.20558E-14
3.21450E+04	5.34997E-14	2.93224E-01	1.56874E-14
3.38826E+04	1.78846E-13	1.10223E-01	1.97130E-14
3.56202E+04	5.72066E-13	4.11069E-02	2.35159E-14
3.73578E+04	1.70251E-12	1.52213E-02	2.59145E-14
3.90953E+04	4.64383E-12	5.59976E-03	2.60043E-14
4.08329E+04	1.16673E-11	2.04790E-03	2.38935E-14
4.25705E+04	2.71381E-11	7.44884E-04	2.02147E-14
4.43080E+04	7.14738E-11	2.69585E-04	1.92682E-14
4.60456E+04	2.36973E-10	9.71173E-05	2.30142E-14
4.77832E+04	9.81854E-10	3.48371E-05	3.42049E-14
4.95207E+04	5.25650E-09	1.24469E-05	6.54273E-14
5.12583E+04	2.72350E-08	4.43076E-06	1.20672E-13
5.29959E+04	1.45946E-07	1.57180E-06	2.29397E-13
5.47335E+04	7.88606E-07	5.55792E-07	4.38301E-13
5.64710E+04	4.27659E-06	1.95937E-07	8.37939E-13
5.82086E+04	2.65669E-05	6.88786E-08	1.82989E-12
5.99462E+04	1.26405E-04	2.41486E-08	3.05250E-12
6.16837E+04	4.94784E-04	8.44507E-09	4.17848E-12
6.34213E+04	1.70928E-03	2.94633E-09	5.03611E-12
6.51589E+04	6.03909E-03	1.02561E-09	6.19373E-12
6.68964E+04	1.40212E-02	3.56249E-10	4.99505E-12

J TOTAL = 4.73410E-08

PLANCK MEAN OPACITY = 3.64259E-16 MEAN-SQUARED PLANCK MEAN OPACITY = 1.58502E-18
ROSSELAND MEAN-FREE-PATH = 5.05529E+25 1/ROSSELAND MEAN-FREE-PATH = 1.97813E-26
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 5.30594E+51 I PRIME = 3.62362E+51

TEMPERATURE = 2.20000E+03 SI/H MASS RATIO = 5.00000E-03 PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	2.95365E-03	3.44477E+04	1.01747E+02
9.55663E+03	4.75367E-03	2.01055E+04	9.55749E+01
1.12942E+04	6.76912E-03	1.06385E+04	7.20134E+01
1.30318E+04	8.54461E-03	5.24356E+03	4.48042E+01
1.47693E+04	9.56693E-03	2.44977E+03	2.34368E+01
1.65069E+04	9.50293E-03	1.09775E+03	1.04319E+01
1.82445E+04	8.37478E-03	4.75752E+02	3.98431E+00
1.99821E+04	6.54832E-03	2.00626E+02	1.31377E+00
2.17196E+04	4.54287E-03	8.27006E+01	3.75698E-01
2.34572E+04	2.79945E-03	3.34398E+01	9.36132E-02
2.51948E+04	1.52718E-03	1.33000E+01	2.03114E-02
2.69323E+04	7.40001E-04	5.21466E+00	3.85886E-03
2.86699E+04	3.18185E-04	2.01914E+00	6.42461E-04
3.04075E+04	1.25513E-04	7.73240E-01	9.70517E-05
3.21450E+04	4.10663E-05	2.93224E-01	1.20416E-05
3.38826E+04	1.23298E-05	1.10223E-01	1.35903E-06
3.56202E+04	3.28478E-06	4.11069E-02	1.35027E-07
3.73578E+04	7.76430E-07	1.52213E-02	1.18183E-08
3.90953E+04	1.62837E-07	5.59976E-03	9.11848E-10
4.08329E+04	3.03118E-08	2.04790E-03	6.20756E-11
4.25705E+04	5.44592E-09	7.44884E-04	4.05658E-12
4.43080E+04	2.24342E-08	2.69585E-04	6.04791E-12
4.60456E+04	1.14065E-06	9.71173E-05	1.10777E-10
4.77832E+04	2.71600E-06	3.48371E-05	9.46176E-11
4.95207E+04	8.53946E-07	1.24469E-05	1.06290E-11
5.12583E+04	1.58575E-06	4.43076E-06	7.02609E-12
5.29959E+04	5.26549E-06	1.57180E-06	8.27627E-12
5.47335E+04	8.20529E-07	5.55792E-07	4.56044E-13
5.64710E+04	4.27709E-06	1.95937E-07	8.38038E-13
5.82086E+04	2.65574E-05	6.88786E-08	1.82924E-12
5.99462E+04	1.26360E-04	2.41486E-08	3.05140E-12
6.16837E+04	4.94606E-04	8.44507E-09	4.17698E-12
6.34213E+04	1.70867E-03	2.94633E-09	5.03430E-12
6.51589E+04	6.03692E-03	1.02561E-09	6.19150E-12
6.68964E+04	1.40162E-02	3.56249E-10	4.99325E-12

J TOTAL = 6.14752E+05

PLANCK MEAN OPACITY = 4.73013E-03 MEAN-SQUARED PLANCK MEAN OPACITY = 2.66385E-05
ROSSELAND MEAN-FREE-PATH = 2.47805E+02 1/ROSSELAND MEAN-FREE-PATH = 4.03544E-03
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.65236E+09 I PRIME = 9.07680E+09

TEMPERATURE = 2.20000E+03 SI/H MASS RATIO = 1.00000E-02 PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	5.90186E-03	3.44477E+04	2.03306E+02
9.55663E+03	9.49858E-03	2.01055E+04	1.90974E+02
1.12942E+04	1.35258E-02	1.06385E+04	1.43894E+02
1.30318E+04	1.70735E-02	5.24356E+03	8.95259E+01
1.47693E+04	1.91162E-02	2.44977E+03	4.68304E+01
1.65069E+04	1.89884E-02	1.09775E+03	2.08445E+01
1.82445E+04	1.67341E-02	4.75752E+02	7.96130E+00
1.99821E+04	1.30846E-02	2.00626E+02	2.62512E+00
2.17196E+04	9.07743E-03	8.27006E+01	7.50709E-01
2.34572E+04	5.59389E-03	3.34398E+01	1.87059E-01
2.51948E+04	3.05177E-03	1.33000E+01	4.05884E-02
2.69323E+04	1.47880E-03	5.21466E+00	7.71143E-03
2.86699E+04	6.35851E-04	2.01914E+00	1.28387E-03
3.04075E+04	2.51923E-04	7.73240E-01	1.94797E-04
3.21450E+04	8.20588E-05	2.93224E-01	2.40616E-05
3.38826E+04	2.46373E-05	1.10223E-01	2.71560E-06
3.56202E+04	6.56360E-06	4.11069E-02	2.69809E-07
3.73578E+04	1.55145E-06	1.52213E-02	2.36152E-08
3.90953E+04	3.25374E-07	5.59976E-03	1.82202E-09
4.08329E+04	6.05569E-08	2.04790E-03	1.24015E-10
4.25705E+04	1.08550E-08	7.44884E-04	8.08570E-12
4.43080E+04	4.50844E-08	2.69585E-04	1.21541E-11
4.60456E+04	3.75182E-06	9.71173E-05	3.64367E-10
4.77832E+04	5.45652E-06	3.48371E-05	1.90089E-10
4.95207E+04	1.70138E-06	1.24469E-05	2.11769E-11
5.12583E+04	3.14196E-06	4.43076E-06	1.39213E-11
5.29959E+04	1.03774E-05	1.57180E-06	1.63112E-11
5.47335E+04	8.52405E-07	5.55792E-07	4.73760E-13
5.64710E+04	4.27759E-06	1.95937E-07	8.38137E-13
5.82086E+04	2.65479E-05	6.88786E-08	1.82858E-12
5.99462E+04	1.26314E-04	2.41486E-08	3.05031E-12
6.16837E+04	4.94428E-04	8.44507E-09	4.17548E-12
6.34213E+04	1.70805E-03	2.94633E-09	5.03249E-12
6.51589E+04	6.03475E-03	1.02561E-09	6.18928E-12
6.68964E+04	1.40112E-02	3.56249E-10	4.99146E-12

J TOTAL = 1.22837E+06

PLANCK MEAN OPACITY = 9.45154E-03 MEAN-SQUARED PLANCK MEAN OPACITY = 1.06358E-04
ROSSELAND MEAN-FREE-PATH = 1.24023E+02 1/ROSSELAND MEAN-FREE-PATH = 8.06302E-03
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 4.15602E+08 I PRIME = 2.28301E+09

TEMPERATURE = 2.20000E+03 SI/H MASS RATIO = 5.00000E-02 PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	2.95830E-02	3.44477E+04	1.01907E+03
9.55663E+03	4.76115E-02	2.01055E+04	9.57253E+02
1.12942E+04	6.77978E-02	1.06385E+04	7.21268E+02
1.30318E+04	8.55808E-02	5.24356E+03	4.48748E+02
1.47693E+04	9.58203E-02	2.44977E+03	2.34738E+02
1.65069E+04	9.51798E-02	1.09775E+03	1.04484E+02
1.82445E+04	8.38815E-02	4.75752E+02	3.99067E+01
1.99821E+04	6.55896E-02	2.00626E+02	1.31590E+01
2.17196E+04	4.55048E-02	8.27006E+01	3.76327E+00
2.34572E+04	2.80468E-02	3.34398E+01	9.37881E-01
2.51948E+04	1.53076E-02	1.33000E+01	2.03591E-01
2.69323E+04	7.41995E-03	5.21466E+00	3.86925E-02
2.86699E+04	3.19056E-03	2.01914E+00	6.44221E-03
3.04075E+04	1.30877E-03	7.73240E-01	1.01199E-03
3.21450E+04	4.11523E-04	2.93224E-01	1.20668E-04
3.38826E+04	1.23553E-04	1.10223E-01	1.36184E-05
3.56202E+04	3.29168E-05	4.11069E-02	1.35311E-06
3.73578E+04	7.78068E-06	1.52213E-02	1.18432E-07
3.90953E+04	1.63173E-06	5.59976E-03	9.13732E-09
4.08329E+04	3.03632E-07	2.04790E-03	6.21809E-10
4.25705E+04	5.43272E-08	7.44884E-04	4.04674E-11
4.43080E+04	2.39018E-07	2.69585E-04	6.44355E-11
4.60456E+04	7.84907E-05	9.71173E-05	7.62280E-09
4.77832E+04	2.85823E-05	3.48371E-05	9.95723E-10
4.95207E+04	8.51929E-06	1.24469E-05	1.06039E-10
5.12583E+04	1.56622E-05	4.43076E-06	6.93957E-11
5.29959E+04	5.15051E-05	1.57180E-06	8.09554E-11
5.47335E+04	1.10887E-06	5.55792E-07	6.16300E-13
5.64710E+04	4.28169E-06	1.95937E-07	8.38938E-13
5.82086E+04	2.64716E-05	6.88786E-08	1.82332E-12
5.99462E+04	1.25951E-04	2.41486E-08	3.04153E-12
6.16837E+04	4.93005E-04	8.44507E-09	4.16347E-12
6.34213E+04	1.70314E-03	2.94633E-09	5.01801E-12
6.51589E+04	6.01738E-03	1.02561E-09	6.17147E-12
6.68964E+04	1.39708E-02	3.56249E-10	4.97710E-12

J TOTAL = 6.15721E+06

PLANCK MEAN OPACITY = 4.73758E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 2.67225E-03
ROSSELAND MEAN-FREE-PATH = 2.47385E+01 1/ROSSELAND MEAN-FREE-PATH = 4.04228E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.65517E+07 I PRIME = 9.09147E+07

TEMPERATURE = 2.20000E+03 SI/H MASS RATIO = 0. PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.70230E-26	3.44477E+04	5.86402E-22
9.55663E+03	9.29728E-26	2.01055E+04	1.86926E-21
1.12942E+04	5.06507E-25	1.06385E+04	5.38849E-21
1.30318E+04	2.75719E-24	5.24356E+03	1.44575E-20
1.47693E+04	1.50050E-23	2.44977E+03	3.67588E-20
1.65069E+04	3.60980E-19	1.09775E+03	3.96268E-16
1.82445E+04	1.69602E-18	4.75752E+02	8.06885E-16
1.99821E+04	7.77908E-18	2.00626E+02	1.56069E-15
2.17196E+04	3.50100E-17	8.27006E+01	2.89535E-15
2.34572E+04	1.49084E-16	3.34398E+01	4.98533E-15
2.51948E+04	6.13926E-16	1.33000E+01	8.16520E-15
2.69323E+04	2.39113E-15	5.21466E+00	1.24689E-14
2.86699E+04	8.80136E-15	2.01914E+00	1.77712E-14
3.04075E+04	3.11848E-14	7.73240E-01	2.41133E-14
3.21450E+04	1.07007E-13	2.93224E-01	3.13771E-14
3.38826E+04	3.57718E-13	1.10223E-01	3.94288E-14
3.56202E+04	1.14422E-12	4.11069E-02	4.70352E-14
3.73578E+04	3.40527E-12	1.52213E-02	5.18328E-14
3.90953E+04	9.28834E-12	5.59976E-03	5.20124E-14
4.08329E+04	2.33363E-11	2.04790E-03	4.77905E-14
4.25705E+04	5.42802E-11	7.44884E-04	4.04324E-14
4.43080E+04	1.42958E-10	2.69585E-04	3.85393E-14
4.60456E+04	4.73980E-10	9.71173E-05	4.60317E-14
4.77832E+04	1.96385E-09	3.48371E-05	6.84149E-14
4.95207E+04	1.05138E-08	1.24469E-05	1.30864E-13
5.12583E+04	5.44739E-08	4.43076E-06	2.41361E-13
5.29959E+04	2.91913E-07	1.57180E-06	4.58828E-13
5.47335E+04	1.57733E-06	5.55792E-07	8.76667E-13
5.64710E+04	8.55380E-06	1.95937E-07	1.67600E-12
5.82086E+04	5.31378E-05	6.88786E-08	3.66005E-12
5.99462E+04	2.52829E-04	2.41486E-08	6.10545E-12
6.16837E+04	9.89640E-04	8.44507E-09	8.35758E-12
6.34213E+04	3.41881E-03	2.94633E-09	1.00730E-11
6.51589E+04	1.20791E-02	1.02561E-09	1.23884E-11
6.68964E+04	2.80445E-02	3.56249E-10	9.99083E-12

J TOTAL = 9.46889E-08

PLANCK MEAN OPACITY = 7.28571E-16 MEAN-SQUARED PLANCK MEAN OPACITY = 6.34102E-18
ROSSELAND MEAN-FREE-PATH = 2.52746E+25 1/ROSSELAND MEAN-FREE-PATH = 3.95654E-26
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.32629E+51 I PRIME = 9.05773E+50

TEMPERATURE = 2.20000E+03 SI/H MASS RATIO = 5.00000E-03 PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	4.38271E-03	3.44477E+04	1.50974E+02
9.55663E+03	7.05362E-03	2.01055E+04	1.41817E+02
1.12942E+04	1.00442E-02	1.06385E+04	1.06855E+02
1.30318E+04	1.26787E-02	5.24356E+03	6.64817E+01
1.47693E+04	1.41957E-02	2.44977E+03	3.47761E+01
1.65069E+04	1.41007E-02	1.09775E+03	1.54791E+01
1.82445E+04	1.24267E-02	4.75752E+02	5.91203E+00
1.99821E+04	9.71657E-03	2.00626E+02	1.94940E+00
2.17196E+04	6.74081E-03	8.27006E+01	5.57469E-01
2.34572E+04	4.15247E-03	3.34398E+01	1.38858E-01
2.51948E+04	2.26596E-03	1.33000E+01	3.01373E-02
2.69323E+04	1.09796E-03	5.21466E+00	5.72551E-03
2.86699E+04	4.72078E-04	2.01914E+00	9.53194E-04
3.04075E+04	1.84142E-04	7.73240E-01	1.42386E-04
3.21450E+04	6.09333E-05	2.93224E-01	1.78671E-05
3.38826E+04	1.82952E-05	1.10223E-01	2.01656E-06
3.56202E+04	4.87402E-06	4.11069E-02	2.00356E-07
3.73578E+04	1.15208E-06	1.52213E-02	1.75363E-08
3.90953E+04	2.41624E-07	5.59976E-03	1.35303E-09
4.08329E+04	4.49827E-08	2.04790E-03	9.21203E-11
4.25705E+04	7.91367E-09	7.44884E-04	5.89477E-12
4.43080E+04	2.38439E-08	2.69585E-04	6.42794E-12
4.60456E+04	8.29218E-07	9.71173E-05	8.05314E-11
4.77832E+04	2.84316E-06	3.48371E-05	9.90472E-11
4.95207E+04	9.00945E-07	1.24469E-05	1.12140E-11
5.12583E+04	1.68964E-06	4.43076E-06	7.48639E-12
5.29959E+04	5.66321E-06	1.57180E-06	8.90141E-12
5.47335E+04	1.61055E-06	5.55792E-07	8.95132E-13
5.64710E+04	8.55287E-06	1.95937E-07	1.67582E-12
5.82086E+04	5.31187E-05	6.88786E-08	3.65874E-12
5.99462E+04	2.52738E-04	2.41486E-08	6.10325E-12
6.16837E+04	9.89284E-04	8.44507E-09	8.35458E-12
6.34213E+04	3.41759E-03	2.94633E-09	1.00693E-11
6.51589E+04	1.20747E-02	1.02561E-09	1.23839E-11
6.68964E+04	2.80344E-02	3.56249E-10	9.98724E-12

J TOTAL = 9.12186E+05

PLANCK MEAN OPACITY = 7.01869E-03 MEAN-SQUARED PLANCK MEAN OPACITY = 5.86511E-05
ROSSELAND MEAN-FREE-PATH = 1.67321E+02 1/ROSSELAND MEAN-FREE-PATH = 5.97652E-03
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 7.93336E+08 I PRIME = 4.36219E+09

TEMPERATURE = 2.20000E+03 SI/H MASS RATIO = 1.00000E-02 PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	8.75760E-03	3.44477E+04	3.01679E+02
9.55663E+03	1.40947E-02	2.01055E+04	2.83380E+02
1.12942E+04	2.00705E-02	1.06385E+04	2.13520E+02
1.30318E+04	2.53348E-02	5.24356E+03	1.32845E+02
1.47693E+04	2.83660E-02	2.44977E+03	6.94902E+01
1.65069E+04	2.81763E-02	1.09775E+03	3.09306E+01
1.82445E+04	2.48313E-02	4.75752E+02	1.18135E+01
1.99821E+04	1.94158E-02	2.00626E+02	3.89533E+00
2.17196E+04	1.34696E-02	8.27006E+01	1.11395E+00
2.34572E+04	8.29760E-03	3.34398E+01	2.77470E-01
2.51948E+04	4.52801E-03	1.33000E+01	6.02224E-02
2.69323E+04	2.19405E-03	5.21466E+00	1.14413E-02
2.86699E+04	9.43351E-04	2.01914E+00	1.90476E-03
3.04075E+04	3.68577E-04	7.73240E-01	2.84999E-04
3.21450E+04	1.21759E-04	2.93224E-01	3.57026E-05
3.38826E+04	3.65580E-05	1.10223E-01	4.02953E-06
3.56202E+04	9.73939E-06	4.11069E-02	4.00356E-07
3.73578E+04	2.30212E-06	1.52213E-02	3.50413E-08
3.90953E+04	4.82809E-07	5.59976E-03	2.70361E-09
4.08329E+04	8.98622E-08	2.04790E-03	1.84029E-10
4.25705E+04	1.57593E-08	7.44884E-04	1.17388E-11
4.43080E+04	4.76872E-08	2.69585E-04	1.28558E-11
4.60456E+04	2.46722E-06	9.71173E-05	2.39610E-10
4.77832E+04	5.69655E-06	3.48371E-05	1.98451E-10
4.95207E+04	1.79011E-06	1.24469E-05	2.22814E-11
5.12583E+04	3.32247E-06	4.43076E-06	1.47211E-11
5.29959E+04	1.10269E-05	1.57180E-06	1.73320E-11
5.47335E+04	1.64373E-06	5.55792E-07	9.13572E-13
5.64710E+04	8.55194E-06	1.95937E-07	1.67564E-12
5.82086E+04	5.30996E-05	6.88786E-08	3.65743E-12
5.99462E+04	2.52647E-04	2.41486E-08	6.10106E-12
6.16837E+04	9.88929E-04	8.44507E-09	8.35158E-12
6.34213E+04	3.41636E-03	2.94633E-09	1.00657E-11
6.51589E+04	1.20704E-02	1.02561E-09	1.23795E-11
6.68964E+04	2.80244E-02	3.56249E-10	9.98366E-12

J TOTAL = 1.82275E+06

PLANCK MEAN OPACITY = 1.40249E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 2.34186E-04
ROSSELAND MEAN-FREE-PATH = 8.37435E+01 1/ROSSELAND MEAN-FREE-PATH = 1.19412E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.99886E+08 I PRIME = 1.09909E+09

TEMPERATURE = 2.20000E+03 SI/H MASS RATIO = 5.00000E-02 PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	4.39077E-02	3.44477E+04	1.51252E+03
9.55663E+03	7.06661E-02	2.01055E+04	1.42078E+03
1.12942E+04	1.00627E-01	1.06385E+04	1.07052E+03
1.30318E+04	1.27021E-01	5.24356E+03	6.66041E+02
1.47693E+04	1.42218E-01	2.44977E+03	3.48402E+02
1.65069E+04	1.41267E-01	1.09775E+03	1.55076E+02
1.82445E+04	1.24497E-01	4.75752E+02	5.92295E+01
1.99821E+04	9.73461E-02	2.00626E+02	1.95302E+01
2.17196E+04	6.75344E-02	8.27006E+01	5.58513E+00
2.34572E+04	4.16053E-02	3.34398E+01	1.39127E+00
2.51948E+04	2.27076E-02	1.33000E+01	3.02010E-01
2.69323E+04	1.10042E-02	5.21466E+00	5.73832E-02
2.86699E+04	4.73139E-03	2.01914E+00	9.55335E-03
3.04075E+04	1.87323E-03	7.73240E-01	1.44845E-03
3.21450E+04	6.10547E-04	2.93224E-01	1.79027E-04
3.38826E+04	1.83314E-04	1.10223E-01	2.02054E-05
3.56202E+04	4.88370E-05	4.11069E-02	2.00754E-06
3.73578E+04	1.15437E-05	1.52213E-02	1.75711E-07
3.90953E+04	2.42094E-06	5.59976E-03	1.35567E-08
4.08329E+04	4.50503E-07	2.04790E-03	9.22587E-10
4.25705E+04	7.88082E-08	7.44884E-04	5.87030E-11
4.43080E+04	2.46004E-07	2.69585E-04	6.63189E-11
4.60456E+04	4.52386E-05	9.71173E-05	4.39346E-09
4.77832E+04	2.92526E-05	3.48371E-05	1.01907E-09
4.95207E+04	8.94568E-06	1.24469E-05	1.11346E-10
5.12583E+04	1.64628E-05	4.43076E-06	7.29427E-11
5.29959E+04	5.41911E-05	1.57180E-06	8.51773E-11
5.47335E+04	1.91074E-06	5.55792E-07	1.06197E-12
5.64710E+04	8.54454E-06	1.95937E-07	1.67419E-12
5.82086E+04	5.29469E-05	6.88786E-08	3.64690E-12
5.99462E+04	2.51920E-04	2.41486E-08	6.08350E-12
6.16837E+04	9.86082E-04	8.44507E-09	8.32754E-12
6.34213E+04	3.40652E-03	2.94633E-09	1.00367E-11
6.51589E+04	1.20356E-02	1.02561E-09	1.23438E-11
6.68964E+04	2.79437E-02	3.56249E-10	9.95492E-12

J TOTAL = 9.13866E+06

PLANCK MEAN OPACITY = 7.03161E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 5.88673E-03
ROSSELAND MEAN-FREE-PATH = 1.67019E+01 1/ROSSELAND MEAN-FREE-PATH = 5.98735E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 7.97229E+06 I PRIME = 4.38327E+07

TEMPERATURE = 3.00000E+03 SI/H MASS RATIO = 0. PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	2.53186E-19	1.37118E+05	3.47164E-14
9.55663E+03	8.88200E-19	1.07340E+05	9.53392E-14
1.12942E+04	3.09332E-18	7.65548E+04	2.36808E-13
1.30318E+04	1.07395E-17	5.09813E+04	5.47513E-13
1.47693E+04	3.72355E-17	3.22179E+04	1.19965E-12
1.65069E+04	3.37392E-14	1.95386E+04	6.59217E-10
1.82445E+04	1.17027E-13	1.14628E+04	1.34146E-09
1.99821E+04	3.94069E-13	6.54433E+03	2.57891E-09
2.17196E+04	1.28695E-12	3.65236E+03	4.70039E-09
2.34572E+04	3.94397E-12	1.99952E+03	7.88604E-09
2.51948E+04	1.16604E-11	1.07675E+03	1.25553E-08
2.69323E+04	3.25598E-11	5.71600E+02	1.86112E-08
2.86699E+04	8.56455E-11	2.99665E+02	2.56650E-08
3.04075E+04	2.17537E-10	1.55377E+02	3.38002E-08
3.21450E+04	5.38654E-10	7.97768E+01	4.29721E-08
3.38826E+04	1.31713E-09	4.06026E+01	5.34788E-08
3.56202E+04	3.12932E-09	2.05022E+01	6.41579E-08
3.73578E+04	7.12726E-09	1.02788E+01	7.32596E-08
3.90953E+04	1.51926E-08	5.11992E+00	7.77849E-08
4.08329E+04	3.11015E-08	2.53517E+00	7.88476E-08
4.25705E+04	6.13652E-08	1.24851E+00	7.66149E-08
4.43080E+04	1.37758E-07	6.11789E-01	8.42786E-08
4.60456E+04	3.62128E-07	2.98406E-01	1.08061E-07
4.77832E+04	1.14336E-06	1.44929E-01	1.65707E-07
4.95207E+04	3.54264E-06	7.01102E-02	2.48375E-07
5.12583E+04	1.18367E-05	3.37910E-02	3.99975E-07
5.29959E+04	4.02752E-05	1.62302E-02	6.53673E-07
5.47335E+04	1.37855E-04	7.77041E-03	1.07119E-06
5.64710E+04	4.74419E-04	3.70895E-03	1.75960E-06
5.82086E+04	1.69254E-03	1.76532E-03	2.98787E-06
5.99462E+04	5.55115E-03	8.37983E-04	4.65177E-06
6.16837E+04	1.36738E-02	3.96782E-04	5.42550E-06
6.34213E+04	2.71394E-02	1.87428E-04	5.08668E-06
6.51589E+04	6.33152E-02	8.83359E-05	5.59301E-06
6.68964E+04	9.80552E-02	4.15446E-05	4.07366E-06

J TOTAL = 5.71387E-02

PLANCK MEAN OPACITY = 7.31291E-11 MEAN-SQUARED PLANCK MEAN OPACITY = 2.21871E-12
ROSSELAND MEAN-FREE-PATH = 1.17300E+18 1/ROSSELAND MEAN-FREE-PATH = 8.52516E-19
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 3.71153E+36 I PRIME = 1.91595E+36

TEMPERATURE = 3.00000E+03 SI/H MASS RATIO = 5.00000E-03 PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.45822E-03	1.37118E+05	1.99948E+02
9.55663E+03	2.10073E-03	1.07340E+05	2.25492E+02
1.12942E+04	2.74699E-03	7.65548E+04	2.10295E+02
1.30318E+04	3.27488E-03	5.09813E+04	1.66957E+02
1.47693E+04	3.56616E-03	3.22179E+04	1.14894E+02
1.65069E+04	3.55011E-03	1.95386E+04	6.93643E+01
1.82445E+04	3.23211E-03	1.14628E+04	3.70489E+01
1.99821E+04	2.69195E-03	6.54433E+03	1.76170E+01
2.17196E+04	2.05124E-03	3.65236E+03	7.49187E+00
2.34572E+04	1.62065E-03	1.99952E+03	3.24051E+00
2.51948E+04	9.15755E-04	1.07675E+03	9.86037E-01
2.69323E+04	5.33837E-04	5.71600E+02	3.05141E-01
2.86699E+04	2.92461E-04	2.99665E+02	8.76405E-02
3.04075E+04	3.69983E-04	1.55377E+02	5.74869E-02
3.21450E+04	6.16786E-05	7.97768E+01	4.92052E-03
3.38826E+04	2.50798E-05	4.06026E+01	1.01831E-03
3.56202E+04	9.36107E-06	2.05022E+01	1.91922E-04
3.73578E+04	3.20171E-06	1.02788E+01	3.29097E-05
3.90953E+04	1.01273E-06	5.11992E+00	5.18512E-06
4.08329E+04	3.16337E-07	2.53517E+00	8.01969E-07
4.25705E+04	2.17213E-07	1.24851E+00	2.71192E-07
4.43080E+04	3.26621E-06	6.11789E-01	1.99823E-06
4.60456E+04	7.93567E-05	2.98406E-01	2.36805E-05
4.77832E+04	1.32897E-04	1.44929E-01	1.92607E-05
4.95207E+04	7.44494E-05	7.01102E-02	5.21966E-06
5.12583E+04	1.31036E-04	3.37910E-02	4.42784E-06
5.29959E+04	3.26519E-04	1.62302E-02	5.29946E-06
5.47335E+04	1.39798E-04	7.77041E-03	1.08629E-06
5.64710E+04	4.74362E-04	3.70895E-03	1.75938E-06
5.82086E+04	1.69193E-03	1.76532E-03	2.98680E-06
5.99462E+04	5.54915E-03	8.37983E-04	4.65009E-06
6.16837E+04	1.36688E-02	3.96782E-04	5.42355E-06
6.34213E+04	2.71297E-02	1.87428E-04	5.08485E-06
6.51589E+04	6.32925E-02	8.83359E-05	5.59100E-06
6.68964E+04	9.80199E-02	4.15446E-05	4.07220E-06

J TOTAL = 1.83104E+06

PLANCK MEAN OPACITY = 2.34346E-03 MEAN-SQUARED PLANCK MEAN OPACITY = 6.08128E-06
ROSSELAND MEAN-FREE-PATH = 6.69530E+02 1/ROSSELAND MEAN-FREE-PATH = 1.49359E-03
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 4.82216E+08 I PRIME = 2.23217E+09

TEMPERATURE = 3.00000E+03 SI/H MASS RATIO = 1.00000E-02 PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	2.91106E-03	1.37118E+05	3.99160E+02
9.55663E+03	4.19372E-03	1.07340E+05	4.50152E+02
1.12942E+04	5.48386E-03	7.65548E+04	4.19816E+02
1.30318E+04	6.53771E-03	5.09813E+04	3.33301E+02
1.47693E+04	7.11928E-03	3.22179E+04	2.29368E+02
1.65069E+04	7.08764E-03	1.95386E+04	1.38483E+02
1.82445E+04	6.45370E-03	1.14628E+04	7.39773E+01
1.99821E+04	5.37743E-03	6.54433E+03	3.51917E+01
2.17196E+04	4.10069E-03	3.65236E+03	1.49772E+01
2.34572E+04	3.24852E-03	1.99952E+03	6.49548E+00
2.51948E+04	1.85204E-03	1.07675E+03	1.99418E+00
2.69323E+04	1.10575E-03	5.71600E+02	6.32047E-01
2.86699E+04	6.71976E-04	2.99665E+02	2.01368E-01
3.04075E+04	1.01893E-03	1.55377E+02	1.58319E-01
3.21450E+04	6.52215E-04	7.97768E+01	5.20316E-02
3.38826E+04	1.33421E-03	4.06026E+01	5.41725E-02
3.56202E+04	3.02975E-03	2.05022E+01	6.21165E-02
3.73578E+04	6.65944E-03	1.02788E+01	6.84511E-02
3.90953E+04	1.35575E-02	5.11992E+00	6.94131E-02
4.08329E+04	2.54264E-02	2.53517E+00	6.44604E-02
4.25705E+04	4.17281E-02	1.24851E+00	5.20978E-02
4.43080E+04	6.95821E-02	6.11789E-01	4.25696E-02
4.60456E+04	1.26226E-01	2.98406E-01	3.76665E-02
4.77832E+04	2.12543E-01	1.44929E-01	3.08038E-02
4.95207E+04	3.17549E-01	7.01102E-02	2.22634E-02
5.12583E+04	5.15796E-01	3.37910E-02	1.74293E-02
5.29959E+04	8.57504E-01	1.62302E-02	1.39174E-02
5.47335E+04	1.29226E+00	7.77041E-03	1.00414E-02
5.64710E+04	1.90151E+00	3.70895E-03	7.05262E-03
5.82086E+04	2.23044E+00	1.76532E-03	3.93745E-03
5.99462E+04	8.92168E-01	8.37983E-04	7.47622E-04
6.16837E+04	1.36639E-02	3.96782E-04	5.42160E-06
6.34213E+04	2.71200E-02	1.87428E-04	5.08303E-06
6.51589E+04	6.32698E-02	8.83359E-05	5.58900E-06
6.68964E+04	9.79848E-02	4.15446E-05	4.07074E-06

J TOTAL = 3.65674E+06

PLANCK MEAN OPACITY = 4.68009E-03 MEAN-SQUARED PLANCK MEAN OPACITY = 2.44242E-05
ROSSELAND MEAN-FREE-PATH = 2.27973E+02 1/ROSSELAND MEAN-FREE-PATH = 4.38649E-03
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 6.37534E+04 I PRIME = 7.26813E+04

TEMPERATURE = 3.00000E+03 SI/H MASS RATIO = 5.00000E-02 PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.45221E-02	1.37118E+05	1.99125E+03
9.55663E+03	2.09213E-02	1.07340E+05	2.24568E+03
1.12942E+04	2.73586E-02	7.65548E+04	2.09443E+03
1.30318E+04	3.26186E-02	5.09813E+04	1.66294E+03
1.47693E+04	3.55260E-02	3.22179E+04	1.14457E+03
1.65069E+04	3.53880E-02	1.95386E+04	6.91432E+02
1.82445E+04	3.22635E-02	1.14628E+04	3.69830E+02
1.99821E+04	2.69699E-02	6.54433E+03	1.76500E+02
2.17196E+04	2.06563E-02	3.65236E+03	7.54442E+01
2.34572E+04	1.65844E-02	1.99952E+03	3.31608E+01
2.51948E+04	9.69844E-03	1.07675E+03	1.04428E+01
2.69323E+04	5.68262E-03	5.71600E+02	3.24818E+00
2.86699E+04	3.07409E-03	2.99665E+02	9.21200E-01
3.04075E+04	6.65196E-03	1.55377E+02	1.03356E+00
3.21450E+04	6.21048E-04	7.97768E+01	4.95452E-02
3.38826E+04	2.52014E-04	4.06026E+01	1.02324E-02
3.56202E+04	9.41012E-05	2.05022E+01	1.92928E-03
3.73578E+04	3.21388E-05	1.02788E+01	3.30349E-04
3.90953E+04	1.00474E-05	5.11992E+00	5.14419E-05
4.08329E+04	2.89821E-06	2.53517E+00	7.34747E-06
4.25705E+04	1.62123E-06	1.24851E+00	2.02411E-06
4.43080E+04	3.64659E-05	6.11789E-01	2.23094E-05
4.60456E+04	4.69234E-03	2.98406E-01	1.40022E-03
4.77832E+04	1.37830E-03	1.44929E-01	1.99757E-04
4.95207E+04	7.10815E-04	7.01102E-02	4.98354E-05
5.12583E+04	1.20081E-03	3.37910E-02	4.05767E-05
5.29959E+04	2.89546E-03	1.62302E-02	4.69939E-05
5.47335E+04	1.57236E-04	7.77041E-03	1.22179E-06
5.64710E+04	4.73847E-04	3.70895E-03	1.75748E-06
5.82086E+04	1.68648E-03	1.76532E-03	2.97718E-06
5.99462E+04	5.53126E-03	8.37983E-04	4.63510E-06
6.16837E+04	1.36248E-02	3.96782E-04	5.40605E-06
6.34213E+04	2.70422E-02	1.87428E-04	5.06845E-06
6.51589E+04	6.30883E-02	8.83359E-05	5.57297E-06
6.68964E+04	9.77038E-02	4.15446E-05	4.05906E-06

J TOTAL = 1.82461E+07

PLANCK MEAN OPACITY = 2.33524E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 6.03779E-04
ROSSELAND MEAN-FREE-PATH = 6.91334E+01 1/ROSSELAND MEAN-FREE-PATH = 1.44648E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 7.01598E+06 I PRIME = 3.27045E+07

TEMPERATURE = 3.00000E+03 SI/H MASS RATIO = 0. PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.27698E-18	1.37118E+05	1.75097E-13
9.55663E+03	4.47977E-18	1.07340E+05	4.80857E-13
1.12942E+04	1.56016E-17	7.65548E+04	1.19438E-12
1.30318E+04	5.41662E-17	5.09813E+04	2.76146E-12
1.47693E+04	1.87803E-16	3.22179E+04	6.05062E-12
1.65069E+04	1.70169E-13	1.95386E+04	3.32486E-09
1.82445E+04	5.90244E-13	1.14628E+04	6.76583E-09
1.99821E+04	1.98754E-12	6.54433E+03	1.30071E-08
2.17196E+04	6.49090E-12	3.65236E+03	2.37071E-08
2.34572E+04	1.98920E-11	1.99952E+03	3.97744E-08
2.51948E+04	5.88110E-11	1.07675E+03	6.33245E-08
2.69323E+04	1.64220E-10	5.71600E+02	9.38682E-08
2.86699E+04	4.31966E-10	2.99665E+02	1.29445E-07
3.04075E+04	1.09718E-09	1.55377E+02	1.70476E-07
3.21450E+04	2.71678E-09	7.97768E+01	2.16736E-07
3.38826E+04	6.64313E-09	4.06026E+01	2.69728E-07
3.56202E+04	1.57832E-08	2.05022E+01	3.23590E-07
3.73578E+04	3.59474E-08	1.02788E+01	3.69496E-07
3.90953E+04	7.66262E-08	5.11992E+00	3.92320E-07
4.08329E+04	1.56865E-07	2.53517E+00	3.97680E-07
4.25705E+04	3.09505E-07	1.24851E+00	3.86419E-07
4.43080E+04	6.94801E-07	6.11789E-01	4.25072E-07
4.60456E+04	1.82645E-06	2.98406E-01	5.45022E-07
4.77832E+04	5.76671E-06	1.44929E-01	8.35766E-07
4.95207E+04	1.78678E-05	7.01102E-02	1.25272E-06
5.12583E+04	5.97003E-05	3.37910E-02	2.01733E-06
5.29959E+04	2.03134E-04	1.62302E-02	3.29690E-06
5.47335E+04	6.95293E-04	7.77041E-03	5.40272E-06
5.64710E+04	2.39280E-03	3.70895E-03	8.87478E-06
5.82086E+04	8.53657E-03	1.76532E-03	1.50698E-05
5.99462E+04	2.79980E-02	8.37983E-04	2.34619E-05
6.16837E+04	6.89656E-02	3.96782E-04	2.73643E-05
6.34213E+04	1.36882E-01	1.87428E-04	2.56554E-05
6.51589E+04	3.19340E-01	8.83359E-05	2.82092E-05
6.68964E+04	4.94556E-01	4.15446E-05	2.05461E-05

J TOTAL = 2.88188E-01

PLANCK MEAN OPACITY = 3.68837E-10 MEAN-SQUARED PLANCK MEAN OPACITY = 5.64404E-11
ROSSELAND MEAN-FREE-PATH = 2.32569E+17 1/ROSSELAND MEAN-FREE-PATH = 4.29979E-18
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.45903E+35 I PRIME = 7.53173E+34

TEMPERATURE = 3.00000E+03 SI/H MASS RATIO = 5.00000E-03 PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	5.83485E-03	1.37118E+05	8.00064E+02
9.55663E+03	8.40576E-03	1.07340E+05	9.02272E+02
1.12942E+04	1.09917E-02	7.65548E+04	8.41466E+02
1.30318E+04	1.31039E-02	5.09813E+04	6.68055E+02
1.47693E+04	1.42694E-02	3.22179E+04	4.59730E+02
1.65069E+04	1.42046E-02	1.95386E+04	2.77538E+02
1.82445E+04	1.29308E-02	1.14628E+04	1.48223E+02
1.99821E+04	1.07664E-02	6.54433E+03	7.04592E+01
2.17196E+04	8.19996E-03	3.65236E+03	2.99492E+01
2.34572E+04	6.05007E-03	1.99952E+03	1.20972E+01
2.51948E+04	3.64292E-03	1.07675E+03	3.92250E+00
2.69323E+04	2.12304E-03	5.71600E+02	1.21353E+00
2.86699E+04	1.14629E-03	2.99665E+02	3.43505E-01
3.04075E+04	9.27093E-04	1.55377E+02	1.44049E-01
3.21450E+04	2.46263E-04	7.97768E+01	1.96461E-02
3.38826E+04	1.00337E-04	4.06026E+01	4.07395E-03
3.56202E+04	3.74570E-05	2.05022E+01	7.67950E-04
3.73578E+04	1.28175E-05	1.02788E+01	1.31748E-04
3.90953E+04	4.06779E-06	5.11992E+00	2.08268E-05
4.08329E+04	1.29738E-06	2.53517E+00	3.28908E-06
4.25705E+04	7.52319E-07	1.24851E+00	9.39275E-07
4.43080E+04	6.24240E-06	6.11789E-01	3.81903E-06
4.60456E+04	9.25066E-05	2.98406E-01	2.76045E-05
4.77832E+04	2.39705E-04	1.44929E-01	3.47403E-05
4.95207E+04	1.44199E-04	7.01102E-02	1.01098E-05
5.12583E+04	2.72064E-04	3.37910E-02	9.19332E-06
5.29959E+04	7.13087E-04	1.62302E-02	1.15735E-05
5.47335E+04	6.98594E-04	7.77041E-03	5.42836E-06
5.64710E+04	2.39214E-03	3.70895E-03	8.87234E-06
5.82086E+04	8.53350E-03	1.76532E-03	1.50644E-05
5.99462E+04	2.79880E-02	8.37983E-04	2.34534E-05
6.16837E+04	6.89409E-02	3.96782E-04	2.73545E-05
6.34213E+04	1.36833E-01	1.87428E-04	2.56462E-05
6.51589E+04	3.19225E-01	8.83359E-05	2.81990E-05
6.68964E+04	4.94378E-01	4.15446E-05	2.05387E-05

J TOTAL = 7.32473E+06

PLANCK MEAN OPACITY = 9.37457E-03 MEAN-SQUARED PLANCK MEAN OPACITY = 9.73362E-05
ROSSELAND MEAN-FREE-PATH = 1.69811E+02 1/ROSSELAND MEAN-FREE-PATH = 5.88888E-03
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 3.42998E+07 I PRIME = 1.59539E+08

TEMPERATURE = 3.00000E+03 SI/H MASS RATIO = 1.00000E-02 PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.16569E-02	1.37118E+05	1.59837E+03
9.55663E+03	1.67931E-02	1.07340E+05	1.80256E+03
1.12942E+04	2.19592E-02	7.65548E+04	1.68108E+03
1.30318E+04	2.61791E-02	5.09813E+04	1.33464E+03
1.47693E+04	2.85075E-02	3.22179E+04	9.18452E+02
1.65069E+04	2.83783E-02	1.95386E+04	5.54472E+02
1.82445E+04	2.58340E-02	1.14628E+04	2.96129E+02
1.99821E+04	2.15112E-02	6.54433E+03	1.40776E+02
2.17196E+04	1.63847E-02	3.65236E+03	5.98429E+01
2.34572E+04	1.20928E-02	1.99952E+03	2.41797E+01
2.51948E+04	7.28559E-03	1.07675E+03	7.84474E+00
2.69323E+04	4.24628E-03	5.71600E+02	2.42717E+00
2.86699E+04	2.29216E-03	2.99665E+02	6.86880E-01
3.04075E+04	1.89362E-03	1.55377E+02	2.94225E-01
3.21450E+04	4.92023E-04	7.97768E+01	3.92521E-02
3.38826E+04	2.00454E-04	4.06026E+01	8.13896E-03
3.56202E+04	7.48187E-05	2.05022E+01	1.53395E-03
3.73578E+04	2.55719E-05	1.02788E+01	2.62849E-04
3.90953E+04	8.05049E-06	5.11992E+00	4.12179E-05
4.08329E+04	2.43547E-06	2.53517E+00	6.17434E-06
4.25705E+04	1.19424E-06	1.24851E+00	1.49101E-06
4.43080E+04	1.18514E-05	6.11789E-01	7.25056E-06
4.60456E+04	2.37609E-04	2.98406E-01	7.09040E-05
4.77832E+04	4.74094E-04	1.44929E-01	6.87101E-05
4.95207E+04	2.70298E-04	7.01102E-02	1.89506E-05
5.12583E+04	4.84038E-04	3.37910E-02	1.63561E-05
5.29959E+04	1.22210E-03	1.62302E-02	1.98350E-05
5.47335E+04	7.01888E-04	7.77041E-03	5.45396E-06
5.64710E+04	2.39149E-03	3.70895E-03	8.86991E-06
5.82086E+04	8.53044E-03	1.76532E-03	1.50590E-05
5.99462E+04	2.79779E-02	8.37983E-04	2.34450E-05
6.16837E+04	6.89161E-02	3.96782E-04	2.73447E-05
6.34213E+04	1.36784E-01	1.87428E-04	2.56370E-05
6.51589E+04	3.19111E-01	8.83359E-05	2.81889E-05
6.68964E+04	4.94201E-01	4.15446E-05	2.05314E-05

J TOTAL = 1.46335E+07

PLANCK MEAN OPACITY = 1.87287E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 3.88496E-04
ROSSELAND MEAN-FREE-PATH = 8.73996E+01 1/ROSSELAND MEAN-FREE-PATH = 1.14417E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.17689E+07 I PRIME = 5.50341E+07

TEMPERATURE = 3.00000E+03 SI/H MASS RATIO = 5.00000E-02 PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	5.83465E-02	1.37118E+05	8.00038E+03
9.55663E+03	8.40550E-02	1.07340E+05	9.02244E+03
1.12942E+04	1.09914E-01	7.65548E+04	8.41444E+03
1.30318E+04	1.31037E-01	5.09813E+04	6.68045E+03
1.47693E+04	1.42695E-01	3.22179E+04	4.59734E+03
1.65069E+04	1.42060E-01	1.95386E+04	2.77565E+03
1.82445E+04	1.29348E-01	1.14628E+04	1.48269E+03
1.99821E+04	1.07759E-01	6.54433E+03	7.05212E+02
2.17196E+04	8.21372E-02	3.65236E+03	2.99994E+02
2.34572E+04	6.07799E-02	1.99952E+03	1.21531E+02
2.51948E+04	3.67913E-02	1.07675E+03	3.96149E+01
2.69323E+04	2.14591E-02	5.71600E+02	1.22660E+01
2.86699E+04	1.15632E-02	2.99665E+02	3.46508E+00
3.04075E+04	1.11571E-02	1.55377E+02	1.73356E+00
3.21450E+04	2.46621E-03	7.97768E+01	1.96746E-01
3.38826E+04	1.00442E-03	4.06026E+01	4.07821E-02
3.56202E+04	3.74872E-04	2.05022E+01	7.68570E-03
3.73578E+04	1.28007E-04	1.02788E+01	1.31576E-03
3.90953E+04	4.00364E-05	5.11992E+00	2.04983E-04
4.08329E+04	1.15750E-05	2.53517E+00	2.93447E-05
4.25705E+04	4.74316E-06	1.24851E+00	5.92187E-06
4.43080E+04	5.95099E-05	6.11789E-01	3.64075E-05
4.60456E+04	3.38872E-03	2.98406E-01	1.01121E-03
4.77832E+04	2.38883E-03	1.44929E-01	3.46211E-04
4.95207E+04	1.28318E-03	7.01102E-02	8.99638E-05
5.12583E+04	2.18670E-03	3.37910E-02	7.38909E-05
5.29959E+04	5.31074E-03	1.62302E-02	8.61943E-05
5.47335E+04	7.28354E-04	7.77041E-03	5.65961E-06
5.64710E+04	2.38623E-03	3.70895E-03	8.85040E-06
5.82086E+04	8.50593E-03	1.76532E-03	1.50157E-05
5.99462E+04	2.78975E-02	8.37983E-04	2.33776E-05
6.16837E+04	6.87180E-02	3.96782E-04	2.72660E-05
6.34213E+04	1.36390E-01	1.87428E-04	2.55633E-05
6.51589E+04	3.18193E-01	8.83359E-05	2.81079E-05
6.68964E+04	4.92780E-01	4.15446E-05	2.04723E-05

J TOTAL = 7.32515E+07

PLANCK MEAN OPACITY = 9.37511E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 9.73447E-03
ROSSELAND MEAN-FREE-PATH = 1.79985E+01 1/ROSSELAND MEAN-FREE-PATH = 5.55603E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 6.60451E+05 I PRIME = 3.10342E+06

TEMPERATURE = 3.00000E+03 SI/H MASS RATIO = 0. PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	2.55923E-18	1.37118E+05	3.50917E-13
9.55663E+03	8.97801E-18	1.07340E+05	9.63697E-13
1.12942E+04	3.12676E-17	7.65548E+04	2.39368E-12
1.30318E+04	1.08556E-16	5.09813E+04	5.53431E-12
1.47693E+04	3.76380E-16	3.22179E+04	1.21262E-11
1.65069E+04	3.41039E-13	1.95386E+04	6.66343E-09
1.82445E+04	1.18292E-12	1.14628E+04	1.35596E-08
1.99821E+04	3.98328E-12	6.54433E+03	2.60679E-08
2.17196E+04	1.30086E-11	3.65236E+03	4.75120E-08
2.34572E+04	3.98660E-11	1.99952E+03	7.97128E-08
2.51948E+04	1.17864E-10	1.07675E+03	1.26910E-07
2.69323E+04	3.29118E-10	5.71600E+02	1.88123E-07
2.86699E+04	8.65713E-10	2.99665E+02	2.59424E-07
3.04075E+04	2.19888E-09	1.55377E+02	3.41656E-07
3.21450E+04	5.44476E-09	7.97768E+01	4.34366E-07
3.38826E+04	1.33136E-08	4.06026E+01	5.40569E-07
3.56202E+04	3.16315E-08	2.05022E+01	6.48514E-07
3.73578E+04	7.20430E-08	1.02788E+01	7.40515E-07
3.90953E+04	1.53568E-07	5.11992E+00	7.86257E-07
4.08329E+04	3.14377E-07	2.53517E+00	7.96999E-07
4.25705E+04	6.20286E-07	1.24851E+00	7.74431E-07
4.43080E+04	1.39247E-06	6.11789E-01	8.51896E-07
4.60456E+04	3.66042E-06	2.98406E-01	1.09229E-06
4.77832E+04	1.15572E-05	1.44929E-01	1.67498E-06
4.95207E+04	3.58093E-05	7.01102E-02	2.51060E-06
5.12583E+04	1.19647E-04	3.37910E-02	4.04299E-06
5.29959E+04	4.07105E-04	1.62302E-02	6.60739E-06
5.47335E+04	1.39345E-03	7.77041E-03	1.08277E-05
5.64710E+04	4.79547E-03	3.70895E-03	1.77862E-05
5.82086E+04	1.71083E-02	1.76532E-03	3.02017E-05
5.99462E+04	5.61115E-02	8.37983E-04	4.70205E-05
6.16837E+04	1.38216E-01	3.96782E-04	5.48414E-05
6.34213E+04	2.74328E-01	1.87428E-04	5.14167E-05
6.51589E+04	6.39996E-01	8.83359E-05	5.65347E-05
6.68964E+04	9.91151E-01	4.15446E-05	4.11769E-05

J TOTAL = 5.77563E-01

PLANCK MEAN OPACITY = 7.39196E-10 MEAN-SQUARED PLANCK MEAN OPACITY = 2.26694E-10
ROSSELAND MEAN-FREE-PATH = 1.16045E+17 1/ROSSELAND MEAN-FREE-PATH = 8.61731E-18
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 3.63257E+34 I PRIME = 1.87519E+34

TEMPERATURE = 3.00000E+03 SI/H MASS RATIO = 5.00000E-03 PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	9.84184E-03	1.37118E+05	1.34950E+03
9.55663E+03	1.41783E-02	1.07340E+05	1.52189E+03
1.12942E+04	1.85400E-02	7.65548E+04	1.41933E+03
1.30318E+04	2.21028E-02	5.09813E+04	1.12683E+03
1.47693E+04	2.40686E-02	3.22179E+04	7.75441E+02
1.65069E+04	2.39592E-02	1.95386E+04	4.68130E+02
1.82445E+04	2.18104E-02	1.14628E+04	2.50008E+02
1.99821E+04	1.81592E-02	6.54433E+03	1.18840E+02
2.17196E+04	1.38296E-02	3.65236E+03	5.05108E+01
2.34572E+04	1.00353E-02	1.99952E+03	2.00659E+01
2.51948E+04	6.14059E-03	1.07675E+03	6.61186E+00
2.69323E+04	3.57861E-03	5.71600E+02	2.04553E+00
2.86699E+04	1.92516E-03	2.99665E+02	5.76904E-01
3.04075E+04	1.36762E-03	1.55377E+02	2.12497E-01
3.21450E+04	4.15187E-04	7.97768E+01	3.31223E-02
3.38826E+04	1.69239E-04	4.06026E+01	6.87155E-03
3.56202E+04	6.31845E-05	2.05022E+01	1.29542E-03
3.73578E+04	2.16309E-05	1.02788E+01	2.22340E-04
3.90953E+04	6.88554E-06	5.11992E+00	3.52534E-05
4.08329E+04	2.23781E-06	2.53517E+00	5.67323E-06
4.25705E+04	1.29530E-06	1.24851E+00	1.61720E-06
4.43080E+04	8.02000E-06	6.11789E-01	4.90655E-06
4.60456E+04	9.84969E-05	2.98406E-01	2.93920E-05
4.77832E+04	2.90075E-04	1.44929E-01	4.20404E-05
4.95207E+04	1.86324E-04	7.01102E-02	1.30632E-05
5.12583E+04	3.72655E-04	3.37910E-02	1.25924E-05
5.29959E+04	1.01464E-03	1.62302E-02	1.64678E-05
5.47335E+04	1.39718E-03	7.77041E-03	1.08567E-05
5.64710E+04	4.79399E-03	3.70895E-03	1.77807E-05
5.82086E+04	1.71022E-02	1.76532E-03	3.01909E-05
5.99462E+04	5.60913E-02	8.37983E-04	4.70036E-05
6.16837E+04	1.38166E-01	3.96782E-04	5.48217E-05
6.34213E+04	2.74229E-01	1.87428E-04	5.13982E-05
6.51589E+04	6.39766E-01	8.83359E-05	5.65143E-05
6.68964E+04	9.90795E-01	4.15446E-05	4.11621E-05

J TOTAL = 1.23542E+07

PLANCK MEAN OPACITY = 1.58115E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 2.76911E-04
ROSSELAND MEAN-FREE-PATH = 1.00554E+02 1/ROSSELAND MEAN-FREE-PATH = 9.94487E-03
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.16302E+07 I PRIME = 5.40950E+07

TEMPERATURE = 3.00000E+03 SI/H MASS RATIO = 1.00000E-02 PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.96634E-02	1.37118E+05	2.69621E+03
9.55663E+03	2.83274E-02	1.07340E+05	3.04065E+03
1.12942E+04	3.70419E-02	7.65548E+04	2.83573E+03
1.30318E+04	4.41601E-02	5.09813E+04	2.25134E+03
1.47693E+04	4.80877E-02	3.22179E+04	1.54929E+03
1.65069E+04	4.78693E-02	1.95386E+04	9.35299E+02
1.82445E+04	4.35765E-02	1.14628E+04	4.99508E+02
1.99821E+04	3.62824E-02	6.54433E+03	2.37444E+02
2.17196E+04	2.76328E-02	3.65236E+03	1.00925E+02
2.34572E+04	2.00542E-02	1.99952E+03	4.00989E+01
2.51948E+04	1.22740E-02	1.07675E+03	1.32160E+01
2.69323E+04	7.15328E-03	5.71600E+02	4.08881E+00
2.86699E+04	3.84783E-03	2.99665E+02	1.15306E+00
3.04075E+04	2.76186E-03	1.55377E+02	4.29130E-01
3.21450E+04	8.29540E-04	7.97768E+01	6.61781E-02
3.38826E+04	3.38120E-04	4.06026E+01	1.37286E-02
3.56202E+04	1.26209E-04	2.05022E+01	2.58756E-03
3.73578E+04	4.31459E-05	1.02788E+01	4.43488E-04
3.90953E+04	1.36038E-05	5.11992E+00	6.96504E-05
4.08329E+04	4.15732E-06	2.53517E+00	1.05395E-05
4.25705E+04	1.96901E-06	1.24851E+00	2.45832E-06
4.43080E+04	1.46869E-05	6.11789E-01	8.98531E-06
4.60456E+04	2.31848E-04	2.98406E-01	6.91847E-05
4.77832E+04	5.68743E-04	1.44929E-01	8.24275E-05
4.95207E+04	3.36583E-04	7.01102E-02	2.35979E-05
5.12583E+04	6.25233E-04	3.37910E-02	2.11273E-05
5.29959E+04	1.62114E-03	1.62302E-02	2.63115E-05
5.47335E+04	1.40091E-03	7.77041E-03	1.08856E-05
5.64710E+04	4.79251E-03	3.70895E-03	1.77752E-05
5.82086E+04	1.70961E-02	1.76532E-03	3.01800E-05
5.99462E+04	5.60712E-02	8.37983E-04	4.69867E-05
6.16837E+04	1.38116E-01	3.96782E-04	5.48021E-05
6.34213E+04	2.74131E-01	1.87428E-04	5.13797E-05
6.51589E+04	6.39537E-01	8.83359E-05	5.64941E-05
6.68964E+04	9.90439E-01	4.15446E-05	4.11474E-05

J TOTAL = 2.46830E+07

PLANCK MEAN OPACITY = 3.15906E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 1.10537E-03
ROSSELAND MEAN-FREE-PATH = 5.20319E+01 1/ROSSELAND MEAN-FREE-PATH = 1.92190E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 4.24065E+06 I PRIME = 1.98494E+07

TEMPERATURE = 3.00000E+03 SI/H MASS RATIO = 5.00000E-02 PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	9.84758E-02	1.37118E+05	1.35028E+04
9.55663E+03	1.41866E-01	1.07340E+05	1.52278E+04
1.12942E+04	1.85509E-01	7.65548E+04	1.42016E+04
1.30318E+04	2.21159E-01	5.09813E+04	1.12750E+04
1.47693E+04	2.40830E-01	3.22179E+04	7.75906E+03
1.65069E+04	2.39744E-01	1.95386E+04	4.68428E+03
1.82445E+04	2.18262E-01	1.14628E+04	2.50189E+03
1.99821E+04	1.81766E-01	6.54433E+03	1.18954E+03
2.17196E+04	1.38475E-01	3.65236E+03	5.05759E+02
2.34572E+04	1.00612E-01	1.99952E+03	2.01176E+02
2.51948E+04	6.16976E-02	1.07675E+03	6.64328E+01
2.69323E+04	3.59683E-02	5.71600E+02	2.05595E+01
2.86699E+04	1.93334E-02	2.99665E+02	5.79355E+00
3.04075E+04	1.50244E-02	1.55377E+02	2.33445E+00
3.21450E+04	4.15658E-03	7.97768E+01	3.31599E-01
3.38826E+04	1.69394E-03	4.06026E+01	6.87784E-02
3.56202E+04	6.32201E-04	2.05022E+01	1.29615E-02
3.73578E+04	2.15882E-04	1.02788E+01	2.21901E-03
3.90953E+04	6.75421E-05	5.11992E+00	3.45810E-04
4.08329E+04	1.95679E-05	2.53517E+00	4.96081E-05
4.25705E+04	7.37922E-06	1.24851E+00	9.21300E-06
4.43080E+04	7.01187E-05	6.11789E-01	4.28979E-05
4.60456E+04	2.71215E-03	2.98406E-01	8.09323E-04
4.77832E+04	2.83123E-03	1.44929E-01	4.10328E-04
4.95207E+04	1.54428E-03	7.01102E-02	1.08270E-04
5.12583E+04	2.65531E-03	3.37910E-02	8.97256E-05
5.29959E+04	6.49587E-03	1.62302E-02	1.05429E-04
5.47335E+04	1.43084E-03	7.77041E-03	1.11182E-05
5.64710E+04	4.78065E-03	3.70895E-03	1.77312E-05
5.82086E+04	1.70469E-02	1.76532E-03	3.00933E-05
5.99462E+04	5.59100E-02	8.37983E-04	4.68516E-05
6.16837E+04	1.37719E-01	3.96782E-04	5.46444E-05
6.34213E+04	2.73343E-01	1.87428E-04	5.12320E-05
6.51589E+04	6.37697E-01	8.83359E-05	5.63316E-05
6.68964E+04	9.87591E-01	4.15446E-05	4.10290E-05

J TOTAL = 1.23618E+08

PLANCK MEAN OPACITY = 1.58213E-01 MEAN-SQUARED PLANCK MEAN OPACITY = 2.77251E-02
ROSSELAND MEAN-FREE-PATH = 1.08171E+01 1/ROSSELAND MEAN-FREE-PATH = 9.24461E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 2.61629E+05 I PRIME = 1.23173E+06

TEMPERATURE = 4.00000E+03 SI/H MASS RATIO = 0. PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	4.69556E-13	3.63754E+05	1.70803E-07
9.55663E+03	1.13833E-12	3.45236E+05	3.92993E-07
1.12942E+04	1.23769E-12	3.00388E+05	3.71788E-07
1.30318E+04	2.28979E-12	2.45004E+05	5.61008E-07
1.47693E+04	7.14459E-12	1.90082E+05	1.35806E-06
1.65069E+04	3.58227E-10	1.41717E+05	5.07670E-05
1.82445E+04	9.86841E-10	1.02295E+05	1.00948E-04
1.99821E+04	2.65463E-09	7.18885E+04	1.90837E-04
2.17196E+04	6.88962E-09	4.93980E+04	3.40334E-04
2.34572E+04	1.67171E-08	3.33016E+04	5.56706E-04
2.51948E+04	3.90676E-08	2.20847E+04	8.62795E-04
2.69323E+04	8.62003E-08	1.44386E+04	1.24461E-03
2.86699E+04	1.78997E-07	9.32257E+03	1.66871E-03
3.04075E+04	3.60348E-07	5.95330E+03	2.14526E-03
3.21450E+04	7.14556E-07	3.76462E+03	2.69003E-03
3.38826E+04	1.42472E-06	2.35980E+03	3.36205E-03
3.56202E+04	2.79983E-06	1.46757E+03	4.10894E-03
3.73578E+04	5.34835E-06	9.06186E+02	4.84660E-03
3.90953E+04	9.81630E-06	5.55924E+02	5.45712E-03
4.08329E+04	1.76633E-05	3.39030E+02	5.98839E-03
4.25705E+04	3.11494E-05	2.05636E+02	6.40542E-03
4.43080E+04	6.07610E-05	1.24104E+02	7.54070E-03
4.60456E+04	1.31182E-04	7.45540E+01	9.78016E-03
4.77832E+04	2.93419E-04	4.45962E+01	1.30854E-02
4.95207E+04	6.75522E-04	2.65706E+01	1.79490E-02
5.12583E+04	1.70746E-03	1.57724E+01	2.69309E-02
5.29959E+04	4.45039E-03	9.33036E+00	4.15237E-02
5.47335E+04	1.11237E-02	5.50170E+00	6.11991E-02
5.64710E+04	2.80937E-02	3.23431E+00	9.08638E-02
5.82086E+04	7.58324E-02	1.89597E+00	1.43776E-01
5.99462E+04	1.74763E-01	1.10846E+00	1.93718E-01
6.16837E+04	3.13421E-01	6.46422E-01	2.02602E-01
6.34213E+04	4.83742E-01	3.76076E-01	1.81924E-01
6.51589E+04	7.19110E-01	2.18302E-01	1.56983E-01
6.68964E+04	8.39607E-01	1.26448E-01	1.06167E-01

J TOTAL = 2.24853E+03

PLANCK MEAN OPACITY = 6.79381E-07 MEAN-SQUARED PLANCK MEAN OPACITY = 2.10929E-07
ROSSELAND MEAN-FREE-PATH = 5.57630E+11 1/ROSSELAND MEAN-FREE-PATH = 1.79330E-12
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 7.65711E+23 I PRIME = 3.16453E+23

TEMPERATURE = 4.00000E+03 SI/H MASS RATIO = 5.00000E-03 PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	5.46418E-04	3.63754E+05	1.98761E+02
9.55663E+03	7.33989E-04	3.45236E+05	2.53400E+02
1.12942E+04	9.08913E-04	3.00388E+05	2.73027E+02
1.30318E+04	1.04459E-03	2.45004E+05	2.55930E+02
1.47693E+04	1.11808E-03	1.90082E+05	2.12528E+02
1.65069E+04	1.11685E-03	1.41717E+05	1.58276E+02
1.82445E+04	1.04209E-03	1.02295E+05	1.06600E+02
1.99821E+04	9.09074E-04	7.18885E+04	6.53519E+01
2.17196E+04	7.44620E-04	4.93980E+04	3.67827E+01
2.34572E+04	1.75973E-03	3.33016E+04	5.86017E+01
2.51948E+04	4.07268E-04	2.20847E+04	8.99438E+00
2.69323E+04	2.70319E-04	1.44386E+04	3.90303E+00
2.86699E+04	2.66639E-04	9.32257E+03	2.48576E+00
3.04075E+04	1.29649E-03	5.95330E+03	7.71838E+00
3.21450E+04	5.43297E-05	3.76462E+03	2.04531E-01
3.38826E+04	2.81271E-05	2.35980E+03	6.63742E-02
3.56202E+04	1.55743E-05	1.46757E+03	2.28563E-02
3.73578E+04	1.11304E-05	9.06186E+02	1.00862E-02
3.90953E+04	1.23285E-05	5.55924E+02	6.85374E-03
4.08329E+04	1.87545E-05	3.39030E+02	6.35834E-03
4.25705E+04	3.27847E-05	2.05636E+02	6.74171E-03
4.43080E+04	9.70373E-05	1.24104E+02	1.20428E-02
4.60456E+04	4.68060E-04	7.45540E+01	3.48957E-02
4.77832E+04	9.79116E-04	4.45962E+01	4.36648E-02
4.95207E+04	1.35688E-03	2.65706E+01	3.60531E-02
5.12583E+04	3.37610E-03	1.57724E+01	5.32493E-02
5.29959E+04	6.80842E-03	9.33036E+00	6.35250E-02
5.47335E+04	1.30113E-02	5.50170E+00	7.15843E-02
5.64710E+04	3.41443E-02	3.23431E+00	1.10433E-01
5.82086E+04	9.53578E-02	1.89597E+00	1.80796E-01
5.99462E+04	2.27891E-01	1.10846E+00	2.52609E-01
6.16837E+04	3.87093E-01	6.46422E-01	2.50225E-01
6.34213E+04	6.35306E-01	3.76076E-01	2.38924E-01
6.51589E+04	1.16118E+00	2.18302E-01	2.53487E-01
6.68964E+04	2.05911E+00	1.26448E-01	2.60371E-01

J TOTAL = 2.85751E+06

PLANCK MEAN OPACITY = 8.63383E-04 MEAN-SQUARED PLANCK MEAN OPACITY = 1.41763E-06
ROSSELAND MEAN-FREE-PATH = 1.79527E+03 1/ROSSELAND MEAN-FREE-PATH = 5.57018E-04
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 3.44706E+07 I PRIME = 1.08861E+08

TEMPERATURE = 4.00000E+03 SI/H MASS RATIO = 1.00000E-02 PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.08966E-03	3.63754E+05	3.96368E+02
9.55663E+03	1.46371E-03	3.45236E+05	5.05328E+02
1.12942E+04	1.81255E-03	3.00388E+05	5.44468E+02
1.30318E+04	2.08314E-03	2.45004E+05	5.10379E+02
1.47693E+04	2.22984E-03	1.90082E+05	4.23853E+02
1.65069E+04	2.22811E-03	1.41717E+05	3.15762E+02
1.82445E+04	2.08036E-03	1.02295E+05	2.12809E+02
1.99821E+04	1.81728E-03	7.18885E+04	1.30642E+02
2.17196E+04	1.49070E-03	4.93980E+04	7.36376E+01
2.34572E+04	3.51934E-03	3.33016E+04	1.17200E+02
2.51948E+04	8.23003E-04	2.20847E+04	1.81758E+01
2.69323E+04	5.45174E-04	1.44386E+04	7.87155E+00
2.86699E+04	5.34956E-04	9.32257E+03	4.98716E+00
3.04075E+04	2.64606E-03	5.95330E+03	1.57528E+01
3.21450E+04	1.07671E-04	3.76462E+03	4.05339E-01
3.38826E+04	5.46772E-05	2.35980E+03	1.29027E-01
3.56202E+04	2.82760E-05	1.46757E+03	4.14969E-02
3.73578E+04	1.68797E-05	9.06186E+02	1.52961E-02
3.90953E+04	1.48266E-05	5.55924E+02	8.24246E-03
4.08329E+04	1.98396E-05	3.39030E+02	6.72622E-03
4.25705E+04	3.44113E-05	2.05636E+02	7.07620E-03
4.43080E+04	1.33570E-04	1.24104E+02	1.65766E-02
4.60456E+04	8.84211E-04	7.45540E+01	6.59214E-02
4.77832E+04	1.66212E-03	4.45962E+01	7.41241E-02
4.95207E+04	2.03457E-03	2.65706E+01	5.40596E-02
5.12583E+04	5.03588E-03	1.57724E+01	7.94281E-02
5.29959E+04	9.15382E-03	9.33036E+00	8.54084E-02
5.47335E+04	1.48893E-02	5.50170E+00	8.19164E-02
5.64710E+04	4.01640E-02	3.23431E+00	1.29903E-01
5.82086E+04	1.14783E-01	1.89597E+00	2.17626E-01
5.99462E+04	2.80749E-01	1.10846E+00	3.11200E-01
6.16837E+04	4.60388E-01	6.46422E-01	2.97605E-01
6.34213E+04	7.86098E-01	3.76076E-01	2.95633E-01
6.51589E+04	1.60099E+00	2.18302E-01	3.49499E-01
6.68964E+04	3.27240E+00	1.26448E-01	4.13789E-01

J TOTAL = 5.69978E+06

PLANCK MEAN OPACITY = 1.72216E-03 MEAN-SQUARED PLANCK MEAN OPACITY = 4.48328E-06
ROSSELAND MEAN-FREE-PATH = 9.67956E+02 1/ROSSELAND MEAN-FREE-PATH = 1.03310E-03
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.48788E+07 I PRIME = 4.89289E+07

TEMPERATURE = 4.00000E+03 SI/H MASS RATIO = 5.00000E-02 PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	5.40892E-03	3.63754E+05	1.96751E+03
9.55663E+03	7.26577E-03	3.45236E+05	2.50841E+03
1.12942E+04	8.99760E-03	3.00388E+05	2.70277E+03
1.30318E+04	1.03418E-02	2.45004E+05	2.53378E+03
1.47693E+04	1.10762E-02	1.90082E+05	2.10539E+03
1.65069E+04	1.10974E-02	1.41717E+05	1.57269E+03
1.82445E+04	1.04170E-02	1.02295E+05	1.06560E+03
1.99821E+04	9.19841E-03	7.18885E+04	6.61260E+02
2.17196E+04	7.63228E-03	4.93980E+04	3.77019E+02
2.34572E+04	1.78741E-02	3.33016E+04	5.95235E+02
2.51948E+04	4.51924E-03	2.20847E+04	9.98059E+01
2.69323E+04	2.95365E-03	1.44386E+04	4.26465E+01
2.86699E+04	2.79134E-03	9.32257E+03	2.60225E+01
3.04075E+04	1.55561E-02	5.95330E+03	9.26101E+01
3.21450E+04	5.33685E-04	3.76462E+03	2.00912E+00
3.38826E+04	2.66196E-04	2.35980E+03	6.28169E-01
3.56202E+04	1.29481E-04	1.46757E+03	1.90022E-01
3.73578E+04	6.26920E-05	9.06186E+02	5.68106E-02
3.90953E+04	3.47328E-05	5.55924E+02	1.93088E-02
4.08329E+04	2.84868E-05	3.39030E+02	9.65785E-03
4.25705E+04	4.73763E-05	2.05636E+02	9.74226E-03
4.43080E+04	4.40710E-04	1.24104E+02	5.46941E-02
4.60456E+04	7.09561E-03	7.45540E+01	5.29006E-01
4.77832E+04	7.13858E-03	4.45962E+01	3.18353E-01
4.95207E+04	7.43291E-03	2.65706E+01	1.97496E-01
5.12583E+04	1.82626E-02	1.57724E+01	2.88046E-01
5.29959E+04	2.78400E-02	9.33036E+00	2.59757E-01
5.47335E+04	2.98687E-02	5.50170E+00	1.64329E-01
5.64710E+04	8.81795E-02	3.23431E+00	2.85200E-01
5.82086E+04	2.69730E-01	1.89597E+00	5.11401E-01
5.99462E+04	7.02361E-01	1.10846E+00	7.78542E-01
6.16837E+04	1.04502E+00	6.46422E-01	6.75523E-01
6.34213E+04	1.98886E+00	3.76076E-01	7.47963E-01
6.51589E+04	5.10909E+00	2.18302E-01	1.11532E+00
6.68964E+04	1.29500E+01	1.26448E-01	1.63750E+00

J TOTAL = 2.84288E+07

PLANCK MEAN OPACITY = 8.58961E-03 MEAN-SQUARED PLANCK MEAN OPACITY = 9.59621E-05
ROSSELAND MEAN-FREE-PATH = 2.32476E+02 1/ROSSELAND MEAN-FREE-PATH = 4.30153E-03
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 2.09452E+06 I PRIME = 7.36022E+06

TEMPERATURE = 4.00000E+03 SI/H MASS RATIO = 0. PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.43243E-12	3.63754E+05	5.21051E-07
9.55663E+03	3.53549E-12	3.45236E+05	1.22058E-06
1.12942E+04	5.14920E-12	3.00388E+05	1.54676E-06
1.30318E+04	1.11267E-11	2.45004E+05	2.72608E-06
1.47693E+04	3.14203E-11	1.90082E+05	5.97243E-06
1.65069E+04	1.94941E-09	1.41717E+05	2.76265E-04
1.82445E+04	5.38148E-09	1.02295E+05	5.50496E-04
1.99821E+04	1.44846E-08	7.18885E+04	1.04127E-03
2.17196E+04	3.75981E-08	4.93980E+04	1.85727E-03
2.34572E+04	9.12324E-08	3.33016E+04	3.03819E-03
2.51948E+04	2.13212E-07	2.20847E+04	4.70871E-03
2.69323E+04	4.70441E-07	1.44386E+04	6.79251E-03
2.86699E+04	9.76405E-07	9.32257E+03	9.10260E-03
3.04075E+04	1.96615E-06	5.95330E+03	1.17051E-02
3.21450E+04	3.89928E-06	3.76462E+03	1.46793E-02
3.38826E+04	7.77508E-06	2.35980E+03	1.83476E-02
3.56202E+04	1.52799E-05	1.46757E+03	2.24243E-02
3.73578E+04	2.91886E-05	9.06186E+02	2.64503E-02
3.90953E+04	5.35728E-05	5.55924E+02	2.97824E-02
4.08329E+04	9.63983E-05	3.39030E+02	3.26819E-02
4.25705E+04	1.69999E-04	2.05636E+02	3.49579E-02
4.43080E+04	3.31606E-04	1.24104E+02	4.11538E-02
4.60456E+04	7.15935E-04	7.45540E+01	5.33758E-02
4.77832E+04	1.60135E-03	4.45962E+01	7.14141E-02
4.95207E+04	3.68670E-03	2.65706E+01	9.79576E-02
5.12583E+04	9.31858E-03	1.57724E+01	1.46977E-01
5.29959E+04	2.42882E-02	9.33036E+00	2.26618E-01
5.47335E+04	6.07080E-02	5.50170E+00	3.33997E-01
5.64710E+04	1.53323E-01	3.23431E+00	4.95894E-01
5.82086E+04	4.13860E-01	1.89597E+00	7.84667E-01
5.99462E+04	9.53777E-01	1.10846E+00	1.05723E+00
6.16837E+04	1.71051E+00	6.46422E-01	1.10571E+00
6.34213E+04	2.64005E+00	3.76076E-01	9.92860E-01
6.51589E+04	3.92458E+00	2.18302E-01	8.56743E-01
6.68964E+04	4.58220E+00	1.26448E-01	5.79410E-01

J TOTAL = 1.22714E+04

PLANCK MEAN OPACITY = 3.70775E-06 MEAN-SQUARED PLANCK MEAN OPACITY = 6.28249E-06
ROSSELAND MEAN-FREE-PATH = 1.63966E+11 1/ROSSELAND MEAN-FREE-PATH = 6.09884E-12
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 7.57255E+22 I PRIME = 2.95479E+22

TEMPERATURE = 4.00000E+03 SI/H MASS RATIO = 5.00000E-03 PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	4.91695E-03	3.63754E+05	1.78856E+03
9.55663E+03	6.60482E-03	3.45236E+05	2.28022E+03
1.12942E+04	8.17886E-03	3.00388E+05	2.45683E+03
1.30318E+04	9.39972E-03	2.45004E+05	2.30297E+03
1.47693E+04	1.00605E-02	1.90082E+05	1.91232E+03
1.65069E+04	1.00465E-02	1.41717E+05	1.42376E+03
1.82445E+04	9.36933E-03	1.02295E+05	9.58431E+02
1.99821E+04	8.16529E-03	7.18885E+04	5.86990E+02
2.17196E+04	6.66328E-03	4.93980E+04	3.29153E+02
2.34572E+04	9.66262E-03	3.33016E+04	3.21781E+02
2.51948E+04	3.61778E-03	2.20847E+04	7.98974E+01
2.69323E+04	2.40396E-03	1.44386E+04	3.47097E+01
2.86699E+04	1.87418E-03	9.32257E+03	1.74721E+01
3.04075E+04	5.45276E-03	5.95330E+03	3.24619E+01
3.21450E+04	4.77795E-04	3.76462E+03	1.79872E+00
3.38826E+04	2.46125E-04	2.35980E+03	5.80806E-01
3.56202E+04	1.28531E-04	1.46757E+03	1.88628E-01
3.73578E+04	7.96137E-05	9.06186E+02	7.21448E-02
3.90953E+04	7.46625E-05	5.55924E+02	4.15067E-02
4.08329E+04	1.04759E-04	3.39030E+02	3.55165E-02
4.25705E+04	1.77533E-04	2.05636E+02	3.65072E-02
4.43080E+04	4.71214E-04	1.24104E+02	5.84797E-02
4.60456E+04	1.96683E-03	7.45540E+01	1.46635E-01
4.77832E+04	4.23003E-03	4.45962E+01	1.88643E-01
4.95207E+04	6.04009E-03	2.65706E+01	1.60489E-01
5.12583E+04	1.41887E-02	1.57724E+01	2.23790E-01
5.29959E+04	3.18966E-02	9.33036E+00	2.97607E-01
5.47335E+04	6.38348E-02	5.50170E+00	3.51200E-01
5.64710E+04	1.63262E-01	3.23431E+00	5.28041E-01
5.82086E+04	4.45950E-01	1.89597E+00	8.45509E-01
5.99462E+04	1.04114E+00	1.10846E+00	1.15406E+00
6.16837E+04	1.83156E+00	6.46422E-01	1.18396E+00
6.34213E+04	2.88929E+00	3.76076E-01	1.08659E+00
6.51589E+04	4.65249E+00	2.18302E-01	1.01565E+00
6.68964E+04	6.59180E+00	1.26448E-01	8.33520E-01

J TOTAL = 2.52580E+07

PLANCK MEAN OPACITY = 7.63157E-03 MEAN-SQUARED PLANCK MEAN OPACITY = 7.14139E-05
ROSSELAND MEAN-FREE-PATH = 2.15119E+02 1/ROSSELAND MEAN-FREE-PATH = 4.64858E-03
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 6.52543E+05 I PRIME = 2.12508E+06

TEMPERATURE = 4.00000E+03 SI/H MASS RATIO = 1.00000E-02 PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	9.81865E-03	3.63754E+05	3.57157E+03
9.55663E+03	1.31891E-02	3.45236E+05	4.55337E+03
1.12942E+04	1.63324E-02	3.00388E+05	4.90605E+03
1.30318E+04	1.87703E-02	2.45004E+05	4.59881E+03
1.47693E+04	2.00903E-02	1.90082E+05	3.81880E+03
1.65069E+04	2.00643E-02	1.41717E+05	2.84346E+03
1.82445E+04	1.87157E-02	1.02295E+05	1.91451E+03
1.99821E+04	1.63173E-02	7.18885E+04	1.17303E+03
2.17196E+04	1.33217E-02	4.93980E+04	6.58066E+02
2.34572E+04	1.93233E-02	3.33016E+04	6.43499E+02
2.51948E+04	7.25383E-03	2.20847E+04	1.60198E+02
2.69323E+04	4.81692E-03	1.44386E+04	6.95495E+01
2.86699E+04	3.75092E-03	9.32257E+03	3.49682E+01
3.04075E+04	1.10536E-02	5.95330E+03	6.58053E+01
3.21450E+04	9.50330E-04	3.76462E+03	3.57763E+00
3.38826E+04	4.83749E-04	2.35980E+03	1.14155E+00
3.56202E+04	2.41438E-04	1.46757E+03	3.54326E-01
3.73578E+04	1.29885E-04	9.06186E+02	1.17700E-01
3.90953E+04	9.56882E-05	5.55924E+02	5.31954E-02
4.08329E+04	1.13095E-04	3.39030E+02	3.83425E-02
4.25705E+04	1.85047E-04	2.05636E+02	3.80522E-02
4.43080E+04	6.11677E-04	1.24104E+02	7.59118E-02
4.60456E+04	3.43570E-03	7.45540E+01	2.56145E-01
4.77832E+04	6.85434E-03	4.45962E+01	3.05677E-01
4.95207E+04	8.38710E-03	2.65706E+01	2.22850E-01
5.12583E+04	1.90458E-02	1.57724E+01	3.00398E-01
5.29959E+04	3.94845E-02	9.33036E+00	3.68405E-01
5.47335E+04	6.69540E-02	5.50170E+00	3.68361E-01
5.64710E+04	1.73178E-01	3.23431E+00	5.60112E-01
5.82086E+04	4.77963E-01	1.89597E+00	9.06206E-01
5.99462E+04	1.12829E+00	1.10846E+00	1.25067E+00
6.16837E+04	1.95231E+00	6.46422E-01	1.26201E+00
6.34213E+04	3.13794E+00	3.76076E-01	1.18010E+00
6.51589E+04	5.37865E+00	2.18302E-01	1.17417E+00
6.68964E+04	8.59660E+00	1.26448E-01	1.08702E+00

J TOTAL = 5.04353E+07

PLANCK MEAN OPACITY = 1.52388E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 2.61289E-04
ROSSELAND MEAN-FREE-PATH = 1.16703E+02 1/ROSSELAND MEAN-FREE-PATH = 8.56878E-03
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 2.88297E+05 I PRIME = 9.73201E+05

TEMPERATURE = 4.00000E+03 SI/H MASS RATIO = 5.00000E-02 PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	4.89665E-02	3.63754E+05	1.78118E+04
9.55663E+03	6.57760E-02	3.45236E+05	2.27083E+04
1.12942E+04	8.14525E-02	3.00388E+05	2.44674E+04
1.30318E+04	9.36143E-02	2.45004E+05	2.29359E+04
1.47693E+04	1.00215E-01	1.90082E+05	1.90491E+04
1.65069E+04	1.00169E-01	1.41717E+05	1.41956E+04
1.82445E+04	9.35903E-02	1.02295E+05	9.57378E+03
1.99821E+04	8.18709E-02	7.18885E+04	5.88558E+03
2.17196E+04	6.70836E-02	4.93980E+04	3.31379E+03
2.34572E+04	9.75071E-02	3.33016E+04	3.24714E+03
2.51948E+04	3.73762E-02	2.20847E+04	8.25441E+02
2.69323E+04	2.47078E-02	1.44386E+04	3.56746E+02
2.86699E+04	1.90836E-02	9.32257E+03	1.77908E+02
3.04075E+04	6.18135E-02	5.95330E+03	3.67994E+02
3.21450E+04	4.73091E-03	3.76462E+03	1.78101E+01
3.38826E+04	2.38346E-03	2.35980E+03	5.62449E+00
3.56202E+04	1.14414E-03	1.46757E+03	1.67910E+00
3.73578E+04	5.31829E-04	9.06186E+02	4.81936E-01
3.90953E+04	2.63801E-04	5.55924E+02	1.46653E-01
4.08329E+04	1.79744E-04	3.39030E+02	6.09387E-02
4.25705E+04	2.45161E-04	2.05636E+02	5.04139E-02
4.43080E+04	1.77999E-03	1.24104E+02	2.20905E-01
4.60456E+04	2.31732E-02	7.45540E+01	1.72766E+00
4.77832E+04	2.79502E-02	4.45962E+01	1.24647E+00
4.95207E+04	2.71644E-02	2.65706E+01	7.21773E-01
5.12583E+04	5.79150E-02	1.57724E+01	9.13460E-01
5.29959E+04	1.00197E-01	9.33036E+00	9.34877E-01
5.47335E+04	9.19463E-02	5.50170E+00	5.05861E-01
5.64710E+04	2.52627E-01	3.23431E+00	8.17075E-01
5.82086E+04	7.34468E-01	1.89597E+00	1.39253E+00
5.99462E+04	1.82659E+00	1.10846E+00	2.02471E+00
6.16837E+04	2.91984E+00	6.46422E-01	1.88745E+00
6.34213E+04	5.13019E+00	3.76076E-01	1.92934E+00
6.51589E+04	1.11970E+01	2.18302E-01	2.44432E+00
6.68964E+04	2.46598E+01	1.26448E-01	3.11818E+00

J TOTAL = 2.51882E+08

PLANCK MEAN OPACITY = 7.61048E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 6.27080E-03
ROSSELAND MEAN-FREE-PATH = 2.85208E+01 1/ROSSELAND MEAN-FREE-PATH = 3.50621E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 4.26309E+04 I PRIME = 1.52729E+05

TEMPERATURE = 4.00000E+03 SI/H MASS RATIO = 0. PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	2.40648E-12	3.63754E+05	8.75365E-07
9.55663E+03	5.99124E-12	3.45236E+05	2.06840E-06
1.12942E+04	9.77796E-12	3.00388E+05	2.93718E-06
1.30318E+04	2.20919E-11	2.45004E+05	5.41262E-06
1.47693E+04	6.06859E-11	1.90082E+05	1.15353E-05
1.65069E+04	3.97807E-09	1.41717E+05	5.63761E-04
1.82445E+04	1.09869E-08	1.02295E+05	1.12390E-03
1.99821E+04	2.95758E-08	7.18885E+04	2.12616E-03
2.17196E+04	7.67735E-08	4.93980E+04	3.79246E-03
2.34572E+04	1.86294E-07	3.33016E+04	6.20390E-03
2.51948E+04	4.35375E-07	2.20847E+04	9.61510E-03
2.69323E+04	9.60633E-07	1.44386E+04	1.38702E-02
2.86699E+04	1.99358E-06	9.32257E+03	1.85853E-02
3.04075E+04	4.01464E-06	5.95330E+03	2.39003E-02
3.21450E+04	7.96206E-06	3.76462E+03	2.99741E-02
3.38826E+04	1.58764E-05	2.35980E+03	3.74651E-02
3.56202E+04	3.12012E-05	1.46757E+03	4.57898E-02
3.73578E+04	5.96026E-05	9.06186E+02	5.40110E-02
3.90953E+04	1.09395E-04	5.55924E+02	6.08151E-02
4.08329E+04	1.96844E-04	3.39030E+02	6.67358E-02
4.25705E+04	3.47135E-04	2.05636E+02	7.13835E-02
4.43080E+04	6.77134E-04	1.24104E+02	8.40354E-02
4.60456E+04	1.46193E-03	7.45540E+01	1.08992E-01
4.77832E+04	3.26993E-03	4.45962E+01	1.45826E-01
4.95207E+04	7.52818E-03	2.65706E+01	2.00028E-01
5.12583E+04	1.90284E-02	1.57724E+01	3.00124E-01
5.29959E+04	4.95962E-02	9.33036E+00	4.62750E-01
5.47335E+04	1.23965E-01	5.50170E+00	6.82017E-01
5.64710E+04	3.13083E-01	3.23431E+00	1.01261E+00
5.82086E+04	8.45095E-01	1.89597E+00	1.60228E+00
5.99462E+04	1.94760E+00	1.10846E+00	2.15884E+00
6.16837E+04	3.49284E+00	6.46422E-01	2.25785E+00
6.34213E+04	5.39094E+00	3.76076E-01	2.02740E+00
6.51589E+04	8.01393E+00	2.18302E-01	1.74946E+00
6.68964E+04	9.35678E+00	1.26448E-01	1.18315E+00

J TOTAL = 2.50581E+04

PLANCK MEAN OPACITY = 7.57117E-06 MEAN-SQUARED PLANCK MEAN OPACITY = 2.61961E-05
ROSSELAND MEAN-FREE-PATH = 9.42380E+10 1/ROSSELAND MEAN-FREE-PATH = 1.06114E-11
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 2.62524E+22 I PRIME = 1.00874E+22

TEMPERATURE = 4.00000E+03 SI/H MASS RATIO = 5.00000E-03 PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.00520E-02	3.63754E+05	3.65644E+03
9.55663E+03	1.35025E-02	3.45236E+05	4.66157E+03
1.12942E+04	1.67204E-02	3.00388E+05	5.02261E+03
1.30318E+04	1.92162E-02	2.45004E+05	4.70806E+03
1.47693E+04	2.05669E-02	1.90082E+05	3.90940E+03
1.65069E+04	2.05371E-02	1.41717E+05	2.91046E+03
1.82445E+04	1.91508E-02	1.02295E+05	1.95902E+03
1.99821E+04	1.66861E-02	7.18885E+04	1.19954E+03
2.17196E+04	1.36055E-02	4.93980E+04	6.72084E+02
2.34572E+04	1.69194E-02	3.33016E+04	5.63444E+02
2.51948E+04	7.37518E-03	2.20847E+04	1.62878E+02
2.69323E+04	4.90217E-03	1.44386E+04	7.07805E+01
2.86699E+04	3.59108E-03	9.32257E+03	3.34781E+01
3.04075E+04	8.29587E-03	5.95330E+03	4.93878E+01
3.21450E+04	9.73263E-04	3.76462E+03	3.66397E+00
3.38826E+04	5.02663E-04	2.35980E+03	1.18618E+00
3.56202E+04	2.62327E-04	1.46757E+03	3.84982E-01
3.73578E+04	1.62311E-04	9.06186E+02	1.47084E-01
3.90953E+04	1.52151E-04	5.55924E+02	8.45846E-02
4.08329E+04	2.13584E-04	3.39030E+02	7.24114E-02
4.25705E+04	3.59533E-04	2.05636E+02	7.39330E-02
4.43080E+04	8.77002E-04	1.24104E+02	1.08840E-01
4.60456E+04	3.20378E-03	7.45540E+01	2.38855E-01
4.77832E+04	7.02589E-03	4.45962E+01	3.13328E-01
4.95207E+04	1.08072E-02	2.65706E+01	2.87153E-01
5.12583E+04	2.54934E-02	1.57724E+01	4.02093E-01
5.29959E+04	6.00025E-02	9.33036E+00	5.59845E-01
5.47335E+04	1.27095E-01	5.50170E+00	6.99237E-01
5.64710E+04	3.22978E-01	3.23431E+00	1.04461E+00
5.82086E+04	8.77067E-01	1.89597E+00	1.66290E+00
5.99462E+04	2.03470E+00	1.10846E+00	2.25539E+00
6.16837E+04	3.61338E+00	6.46422E-01	2.33577E+00
6.34213E+04	5.63948E+00	3.76076E-01	2.12087E+00
6.51589E+04	8.74121E+00	2.18302E-01	1.90822E+00
6.68964E+04	1.13670E+01	1.26448E-01	1.43733E+00

J TOTAL = 5.14323E+07

PLANCK MEAN OPACITY = 1.55400E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 2.90093E-04
ROSSELAND MEAN-FREE-PATH = 1.06048E+02 1/ROSSELAND MEAN-FREE-PATH = 9.42973E-03
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.57164E+05 I PRIME = 5.11816E+05

TEMPERATURE = 4.00000E+03 SI/H MASS RATIO = 1.00000E-02 PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	2.00776E-02	3.63754E+05	7.30329E+03
9.55663E+03	2.69697E-02	3.45236E+05	9.31091E+03
1.12942E+04	3.33970E-02	3.00388E+05	1.00321E+04
1.30318E+04	3.83822E-02	2.45004E+05	9.40380E+03
1.47693E+04	4.10804E-02	1.90082E+05	7.80864E+03
1.65069E+04	4.10228E-02	1.41717E+05	5.81364E+03
1.82445E+04	3.82574E-02	1.02295E+05	3.91353E+03
1.99821E+04	3.33406E-02	7.18885E+04	2.39680E+03
2.17196E+04	2.71911E-02	4.93980E+04	1.34319E+03
2.34572E+04	3.38233E-02	3.33016E+04	1.12637E+03
2.51948E+04	1.47604E-02	2.20847E+04	3.25978E+02
2.69323E+04	9.80751E-03	1.44386E+04	1.41607E+02
2.86699E+04	7.18019E-03	9.32257E+03	6.69378E+01
3.04075E+04	1.67341E-02	5.95330E+03	9.96231E+01
3.21450E+04	1.93614E-03	3.76462E+03	7.28885E+00
3.38826E+04	9.88185E-04	2.35980E+03	2.33192E+00
3.56202E+04	4.92853E-04	1.46757E+03	7.23294E-01
3.73578E+04	2.64754E-04	9.06186E+02	2.39916E-01
3.90953E+04	1.94797E-04	5.55924E+02	1.08293E-01
4.08329E+04	2.30281E-04	3.39030E+02	7.80723E-02
4.25705E+04	3.71902E-04	2.05636E+02	7.64764E-02
4.43080E+04	1.07766E-03	1.24104E+02	1.33742E-01
4.60456E+04	5.16378E-03	7.45540E+01	3.84980E-01
4.77832E+04	1.07762E-02	4.45962E+01	4.80578E-01
4.95207E+04	1.40789E-02	2.65706E+01	3.74083E-01
5.12583E+04	3.19442E-02	1.57724E+01	5.03837E-01
5.29959E+04	7.03857E-02	9.33036E+00	6.56724E-01
5.47335E+04	1.30219E-01	5.50170E+00	7.16424E-01
5.64710E+04	3.32854E-01	3.23431E+00	1.07655E+00
5.82086E+04	9.08979E-01	1.89597E+00	1.72340E+00
5.99462E+04	2.12164E+00	1.10846E+00	2.35176E+00
6.16837E+04	3.73370E+00	6.46422E-01	2.41354E+00
6.34213E+04	5.88755E+00	3.76076E-01	2.21417E+00
6.51589E+04	9.46710E+00	2.18302E-01	2.06669E+00
6.68964E+04	1.33734E+01	1.26448E-01	1.69104E+00

J TOTAL = 1.02715E+08

PLANCK MEAN OPACITY = 3.10347E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 1.06938E-03
ROSSELAND MEAN-FREE-PATH = 5.75486E+01 1/ROSSELAND MEAN-FREE-PATH = 1.73766E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 6.95879E+04 I PRIME = 2.34975E+05

TEMPERATURE = 4.00000E+03 SI/H MASS RATIO = 5.00000E-02 PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.00322E-01	3.63754E+05	3.64927E+04
9.55663E+03	1.34761E-01	3.45236E+05	4.65244E+04
1.12942E+04	1.66878E-01	3.00388E+05	5.01281E+04
1.30318E+04	1.91791E-01	2.45004E+05	4.69896E+04
1.47693E+04	2.05291E-01	1.90082E+05	3.90222E+04
1.65069E+04	2.05087E-01	1.41717E+05	2.90644E+04
1.82445E+04	1.91418E-01	1.02295E+05	1.95810E+04
1.99821E+04	1.67093E-01	7.18885E+04	1.20120E+04
2.17196E+04	1.36519E-01	4.93980E+04	6.74375E+03
2.34572E+04	1.70182E-01	3.33016E+04	5.66734E+03
2.51948E+04	7.49624E-02	2.20847E+04	1.65552E+03
2.69323E+04	4.96941E-02	1.44386E+04	7.17513E+02
2.86699E+04	3.62561E-02	9.32257E+03	3.38000E+02
3.04075E+04	9.03720E-02	5.95330E+03	5.38011E+02
3.21450E+04	9.64976E-03	3.76462E+03	3.63277E+01
3.38826E+04	4.87624E-03	2.35980E+03	1.15069E+01
3.56202E+04	2.33896E-03	1.46757E+03	3.43257E+00
3.73578E+04	1.08515E-03	9.06186E+02	9.83349E-01
3.90953E+04	5.36326E-04	5.55924E+02	2.98157E-01
4.08329E+04	3.64003E-04	3.39030E+02	1.23408E-01
4.25705E+04	4.71036E-04	2.05636E+02	9.68618E-02
4.43080E+04	2.73132E-03	1.24104E+02	3.38970E-01
4.60456E+04	2.89237E-02	7.45540E+01	2.15638E+00
4.77832E+04	4.09458E-02	4.45962E+01	1.82603E+00
4.95207E+04	4.03102E-02	2.65706E+01	1.07106E+00
5.12583E+04	8.36747E-02	1.57724E+01	1.31975E+00
5.29959E+04	1.53641E-01	9.33036E+00	1.43353E+00
5.47335E+04	1.55303E-01	5.50170E+00	8.54432E-01
5.64710E+04	4.12159E-01	3.23431E+00	1.33305E+00
5.82086E+04	1.16523E+00	1.89597E+00	2.20925E+00
5.99462E+04	2.81977E+00	1.10846E+00	3.12561E+00
6.16837E+04	4.69983E+00	6.46422E-01	3.03807E+00
6.34213E+04	7.87956E+00	3.76076E-01	2.96331E+00
6.51589E+04	1.52960E+01	2.18302E-01	3.33915E+00
6.68964E+04	2.94845E+01	1.26448E-01	3.72825E+00

J TOTAL = 5.13549E+08

PLANCK MEAN OPACITY = 1.55166E-01 MEAN-SQUARED PLANCK MEAN OPACITY = 2.59099E-02
ROSSELAND MEAN-FREE-PATH = 1.41172E+01 1/ROSSELAND MEAN-FREE-PATH = 7.08357E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.05134E+04 I PRIME = 3.77296E+04

TEMPERATURE = 5.00000E+03 SI/H MASS RATIO = 0. PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.90643E-09	6.70766E+05	1.27877E-03
9.55663E+03	3.91742E-09	7.09896E+05	2.78096E-03
1.12942E+04	2.80478E-09	6.92124E+05	1.94126E-03
1.30318E+04	3.18131E-09	6.34807E+05	2.01952E-03
1.47693E+04	9.99397E-09	5.55228E+05	5.54893E-03
1.65069E+04	6.58090E-08	4.67491E+05	3.07651E-02
1.82445E+04	1.47948E-07	3.81535E+05	5.64472E-02
1.99821E+04	3.38563E-07	3.03398E+05	1.02719E-01
2.17196E+04	7.55827E-07	2.36024E+05	1.78394E-01
2.34572E+04	1.58432E-06	1.80198E+05	2.85492E-01
2.51948E+04	3.20031E-06	1.35365E+05	4.33209E-01
2.69323E+04	6.10953E-06	1.00260E+05	6.12543E-01
2.86699E+04	1.11119E-05	7.33441E+04	8.14992E-01
3.04075E+04	1.93388E-05	5.30684E+04	1.02628E+00
3.21450E+04	3.35086E-05	3.80245E+04	1.27415E+00
3.38826E+04	5.92229E-05	2.70078E+04	1.59948E+00
3.56202E+04	1.05246E-04	1.90322E+04	2.00306E+00
3.73578E+04	1.84375E-04	1.33165E+04	2.45523E+00
3.90953E+04	3.11784E-04	9.25704E+03	2.88619E+00
4.08329E+04	5.18623E-04	6.39704E+03	3.31765E+00
4.25705E+04	8.39545E-04	4.39669E+03	3.69122E+00
4.43080E+04	1.47114E-03	3.00677E+03	4.42337E+00
4.60456E+04	2.78340E-03	2.04677E+03	5.69699E+00
4.77832E+04	5.37671E-03	1.38734E+03	7.45932E+00
4.95207E+04	1.11568E-02	9.36639E+02	1.04499E+01
5.12583E+04	2.26093E-02	6.30024E+02	1.42444E+01
5.29959E+04	4.64535E-02	4.22322E+02	1.96183E+01
5.47335E+04	9.67576E-02	2.82182E+02	2.73032E+01
5.64710E+04	2.02115E-01	1.87975E+02	3.79925E+01
5.82086E+04	4.41562E-01	1.24864E+02	5.51352E+01
5.99462E+04	8.47543E-01	8.27206E+01	7.01092E+01
6.16837E+04	1.17235E+00	5.46631E+01	6.40844E+01
6.34213E+04	1.49510E+00	3.60364E+01	5.38780E+01
6.51589E+04	1.86829E+00	2.37033E+01	4.42847E+01
6.68964E+04	1.84396E+00	1.55579E+01	2.86881E+01

J TOTAL = 8.06491E+05

PLANCK MEAN OPACITY = 8.72432E-05 MEAN-SQUARED PLANCK MEAN OPACITY = 7.27090E-05
ROSSELAND MEAN-FREE-PATH = 1.39303E+08 1/ROSSELAND MEAN-FREE-PATH = 7.17857E-09
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 4.88941E+16 I PRIME = 1.93065E+16

TEMPERATURE = 5.00000E+03 SI/H MASS RATIO = 5.00000E-03 PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.66810E-03	6.70766E+05	1.11890E+03
9.55663E+03	2.15920E-03	7.09896E+05	1.53281E+03
1.12942E+04	2.31189E-03	6.92124E+05	1.60011E+03
1.30318E+04	2.26519E-03	6.34807E+05	1.43796E+03
1.47693E+04	2.13167E-03	5.55228E+05	1.18356E+03
1.65069E+04	1.98148E-03	4.67491E+05	9.26322E+02
1.82445E+04	1.82162E-03	3.81535E+05	6.95012E+02
1.99821E+04	1.65592E-03	3.03398E+05	5.02401E+02
2.17196E+04	1.52684E-03	2.36024E+05	3.60372E+02
2.34572E+04	2.38245E-03	1.80198E+05	4.29314E+02
2.51948E+04	1.27156E-03	1.35365E+05	1.72125E+02
2.69323E+04	1.16325E-03	1.00260E+05	1.16628E+02
2.86699E+04	1.18538E-03	7.33441E+04	8.69406E+01
3.04075E+04	1.90750E-03	5.30684E+04	1.01228E+02
3.21450E+04	9.14412E-04	3.80245E+04	3.47700E+01
3.38826E+04	8.73067E-04	2.70078E+04	2.35796E+01
3.56202E+04	8.61146E-04	1.90322E+04	1.63895E+01
3.73578E+04	8.89510E-04	1.33165E+04	1.18452E+01
3.90953E+04	9.72479E-04	9.25704E+03	9.00227E+00
4.08329E+04	1.13937E-03	6.39704E+03	7.28862E+00
4.25705E+04	1.42573E-03	4.39669E+03	6.26847E+00
4.43080E+04	2.06739E-03	3.00677E+03	6.21615E+00
4.60456E+04	3.60503E-03	2.04677E+03	7.37868E+00
4.77832E+04	6.40965E-03	1.38734E+03	8.89236E+00
4.95207E+04	1.24815E-02	9.36639E+02	1.16906E+01
5.12583E+04	2.52657E-02	6.30024E+02	1.59180E+01
5.29959E+04	5.00625E-02	4.22322E+02	2.11425E+01
5.47335E+04	1.01847E-01	2.82182E+02	2.87394E+01
5.64710E+04	2.15200E-01	1.87975E+02	4.04521E+01
5.82086E+04	4.76386E-01	1.24864E+02	5.94835E+01
5.99462E+04	9.29459E-01	8.27206E+01	7.68854E+01
6.16837E+04	1.28546E+00	5.46631E+01	7.02673E+01
6.34213E+04	1.70274E+00	3.60364E+01	6.13606E+01
6.51589E+04	2.35872E+00	2.37033E+01	5.59095E+01
6.68964E+04	3.06829E+00	1.55579E+01	4.77362E+01

J TOTAL = 1.89133E+07

PLANCK MEAN OPACITY = 2.04597E-03 MEAN-SQUARED PLANCK MEAN OPACITY = 1.14132E-04
ROSSELAND MEAN-FREE-PATH = 5.66311E+02 1/ROSSELAND MEAN-FREE-PATH = 1.76582E-03
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 3.49530E+05 I PRIME = 4.55189E+05

TEMPERATURE = 5.00000E+03 SI/H MASS RATIO = 1.00000E-02 PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	2.41004E-03	6.70766E+05	1.61658E+03
9.55663E+03	3.11949E-03	7.09896E+05	2.21451E+03
1.12942E+04	3.34691E-03	6.92124E+05	2.31648E+03
1.30318E+04	3.28998E-03	6.34807E+05	2.08850E+03
1.47693E+04	3.10481E-03	5.55228E+05	1.72388E+03
1.65069E+04	2.89330E-03	4.67491E+05	1.35259E+03
1.82445E+04	2.66316E-03	3.81535E+05	1.01609E+03
1.99821E+04	2.42087E-03	3.03398E+05	7.34486E+02
2.17196E+04	2.23271E-03	2.36024E+05	5.26973E+02
2.34572E+04	4.01485E-03	1.80198E+05	7.23469E+02
2.51948E+04	1.84657E-03	1.35365E+05	2.49960E+02
2.69323E+04	1.68218E-03	1.00260E+05	1.68655E+02
2.86699E+04	1.77227E-03	7.33441E+04	1.29985E+02
3.04075E+04	3.26637E-03	5.30684E+04	1.73341E+02
3.21450E+04	1.29748E-03	3.80245E+04	4.93359E+01
3.38826E+04	1.22440E-03	2.70078E+04	3.30684E+01
3.56202E+04	1.18621E-03	1.90322E+04	2.25762E+01
3.73578E+04	1.19203E-03	1.33165E+04	1.58737E+01
3.90953E+04	1.25556E-03	9.25704E+03	1.16228E+01
4.08329E+04	1.40518E-03	6.39704E+03	8.98896E+00
4.25705E+04	1.67748E-03	4.39669E+03	7.37537E+00
4.43080E+04	2.34740E-03	3.00677E+03	7.05808E+00
4.60456E+04	4.13709E-03	2.04677E+03	8.46769E+00
4.77832E+04	7.15916E-03	1.38734E+03	9.93218E+00
4.95207E+04	1.35389E-02	9.36639E+02	1.26811E+01
5.12583E+04	2.76753E-02	6.30024E+02	1.74361E+01
5.29959E+04	5.34422E-02	4.22322E+02	2.25698E+01
5.47335E+04	1.06726E-01	2.82182E+02	3.01162E+01
5.64710E+04	2.28115E-01	1.87975E+02	4.28799E+01
5.82086E+04	5.11135E-01	1.24864E+02	6.38225E+01
5.99462E+04	1.01150E+00	8.27206E+01	8.36716E+01
6.16837E+04	1.39882E+00	5.46631E+01	7.64641E+01
6.34213E+04	1.91102E+00	3.60364E+01	6.88663E+01
6.51589E+04	2.85091E+00	2.37033E+01	6.75761E+01
6.68964E+04	4.29729E+00	1.55579E+01	6.68568E+01

J TOTAL = 2.73889E+07

PLANCK MEAN OPACITY = 2.96282E-03 MEAN-SQUARED PLANCK MEAN OPACITY = 1.68368E-04
ROSSELAND MEAN-FREE-PATH = 3.88551E+02 1/ROSSELAND MEAN-FREE-PATH = 2.57367E-03
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.66675E+05 I PRIME = 2.20946E+05

TEMPERATURE = 5.00000E+03 SI/H MASS RATIO = 5.00000E-02 PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	5.73243E-03	6.70766E+05	3.84512E+03
9.55663E+03	7.41837E-03	7.09896E+05	5.26627E+03
1.12942E+04	8.02305E-03	6.92124E+05	5.55294E+03
1.30318E+04	7.99867E-03	6.34807E+05	5.07761E+03
1.47693E+04	7.63229E-03	5.55228E+05	4.23766E+03
1.65069E+04	7.18576E-03	4.67491E+05	3.35927E+03
1.82445E+04	6.65356E-03	3.81535E+05	2.53856E+03
1.99821E+04	6.06029E-03	3.03398E+05	1.83868E+03
2.17196E+04	5.60325E-03	2.36024E+05	1.32250E+03
2.34572E+04	1.49967E-02	1.80198E+05	2.70239E+03
2.51948E+04	4.54141E-03	1.35365E+05	6.14749E+02
2.69323E+04	4.06571E-03	1.00260E+05	4.07630E+02
2.86699E+04	4.83699E-03	7.33441E+04	3.54765E+02
3.04075E+04	1.28709E-02	5.30684E+04	6.83037E+02
3.21450E+04	2.96969E-03	3.80245E+04	1.12921E+02
3.38826E+04	2.74248E-03	2.70078E+04	7.40682E+01
3.56202E+04	2.58352E-03	1.90322E+04	4.91701E+01
3.73578E+04	2.48863E-03	1.33165E+04	3.31399E+01
3.90953E+04	2.46720E-03	9.25704E+03	2.28390E+01
4.08329E+04	2.54251E-03	6.39704E+03	1.62645E+01
4.25705E+04	2.76035E-03	4.39669E+03	1.21364E+01
4.43080E+04	3.71147E-03	3.00677E+03	1.11595E+01
4.60456E+04	7.89760E-03	2.04677E+03	1.61646E+01
4.77832E+04	1.23629E-02	1.38734E+03	1.71516E+01
4.95207E+04	2.12464E-02	9.36639E+02	1.99002E+01
5.12583E+04	4.62470E-02	6.30024E+02	2.91367E+01
5.29959E+04	7.98138E-02	4.22322E+02	3.37071E+01
5.47335E+04	1.45160E-01	2.82182E+02	4.09614E+01
5.64710E+04	3.30917E-01	1.87975E+02	6.22041E+01
5.82086E+04	7.88778E-01	1.24864E+02	9.84901E+01
5.99462E+04	1.66779E+00	8.27206E+01	1.37960E+02
6.16837E+04	2.30596E+00	5.46631E+01	1.26051E+02
6.34213E+04	3.57814E+00	3.60364E+01	1.28943E+02
6.51589E+04	6.79124E+00	2.37033E+01	1.60975E+02
6.68964E+04	1.41370E+01	1.55579E+01	2.19942E+02

J TOTAL = 6.81553E+07

PLANCK MEAN OPACITY = 7.37278E-03 MEAN-SQUARED PLANCK MEAN OPACITY = 1.05040E-03
ROSSELAND MEAN-FREE-PATH = 1.57962E+02 1/ROSSELAND MEAN-FREE-PATH = 6.33062E-03
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 2.87364E+04 I PRIME = 3.98949E+04

TEMPERATURE = 5.00000E+03 SI/H MASS RATIO = 0. PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	5.62669E-09	6.70766E+05	3.77419E-03
9.55663E+03	1.16452E-08	7.09896E+05	8.26690E-03
1.12942E+04	1.01310E-08	6.92124E+05	7.01188E-03
1.30318E+04	1.41871E-08	6.34807E+05	9.00609E-03
1.47693E+04	3.87475E-08	5.55228E+05	2.15137E-02
1.65069E+04	4.40869E-07	4.67491E+05	2.06102E-01
1.82445E+04	1.02613E-06	3.81535E+05	3.91504E-01
1.99821E+04	2.37538E-06	3.03398E+05	7.20686E-01
2.17196E+04	5.32274E-06	2.36024E+05	1.25630E+00
2.34572E+04	1.11701E-05	1.80198E+05	2.01282E+00
2.51948E+04	2.25732E-05	1.35365E+05	3.05563E+00
2.69323E+04	4.31009E-05	1.00260E+05	4.32131E+00
2.86699E+04	7.77553E-05	7.33441E+04	5.70290E+00
3.04075E+04	1.35823E-04	5.30684E+04	7.20791E+00
3.21450E+04	2.35821E-04	3.80245E+04	8.96697E+00
3.38826E+04	4.17321E-04	2.70078E+04	1.12709E+01
3.56202E+04	7.42137E-04	1.90322E+04	1.41245E+01
3.73578E+04	1.30052E-03	1.33165E+04	1.73184E+01
3.90953E+04	2.19953E-03	9.25704E+03	2.03612E+01
4.08329E+04	3.65896E-03	6.39704E+03	2.34065E+01
4.25705E+04	5.92331E-03	4.39669E+03	2.60429E+01
4.43080E+04	1.03796E-02	3.00677E+03	3.12092E+01
4.60456E+04	1.96386E-02	2.04677E+03	4.01957E+01
4.77832E+04	3.79361E-02	1.38734E+03	5.26303E+01
4.95207E+04	7.87186E-02	9.36639E+02	7.37309E+01
5.12583E+04	1.59523E-01	6.30024E+02	1.00504E+02
5.29959E+04	3.27760E-01	4.22322E+02	1.38420E+02
5.47335E+04	6.82690E-01	2.82182E+02	1.92642E+02
5.64710E+04	1.42606E+00	1.87975E+02	2.68063E+02
5.82086E+04	3.11552E+00	1.24864E+02	3.89016E+02
5.99462E+04	5.97998E+00	8.27206E+01	4.94668E+02
6.16837E+04	8.27173E+00	5.46631E+01	4.52158E+02
6.34213E+04	1.05489E+01	3.60364E+01	3.80145E+02
6.51589E+04	1.31820E+01	2.37033E+01	3.12458E+02
6.68964E+04	1.30104E+01	1.55579E+01	2.02414E+02

J TOTAL = 5.68997E+06

PLANCK MEAN OPACITY = 6.15519E-04 MEAN-SQUARED PLANCK MEAN OPACITY = 3.61964E-03
ROSSELAND MEAN-FREE-PATH = 4.00128E+07 1/ROSSELAND MEAN-FREE-PATH = 2.49920E-08
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 4.42209E+15 I PRIME = 1.56363E+15

TEMPERATURE = 5.00000E+03 SI/H MASS RATIO = 5.00000E-03 PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.27679E-02	6.70766E+05	8.56427E+03
9.55663E+03	1.47975E-02	7.09896E+05	1.05047E+04
1.12942E+04	1.54800E-02	6.92124E+05	1.07141E+04
1.30318E+04	1.52333E-02	6.34807E+05	9.67022E+03
1.47693E+04	1.45038E-02	5.55228E+05	8.05291E+03
1.65069E+04	1.35940E-02	4.67491E+05	6.35506E+03
1.82445E+04	1.25239E-02	3.81535E+05	4.77830E+03
1.99821E+04	1.13238E-02	3.03398E+05	3.43561E+03
2.17196E+04	1.02778E-02	2.36024E+05	2.42581E+03
2.34572E+04	1.90218E-02	1.80198E+05	3.42769E+03
2.51948E+04	8.09424E-03	1.35365E+05	1.09568E+03
2.69323E+04	7.17613E-03	1.00260E+05	7.19482E+02
2.86699E+04	7.56210E-03	7.33441E+04	5.54636E+02
3.04075E+04	1.49767E-02	5.30684E+04	7.94789E+02
3.21450E+04	5.22722E-03	3.80245E+04	1.98762E+02
3.38826E+04	4.94241E-03	2.70078E+04	1.33483E+02
3.56202E+04	4.89196E-03	1.90322E+04	9.31049E+01
3.73578E+04	5.13948E-03	1.33165E+04	6.84399E+01
3.90953E+04	5.77797E-03	9.25704E+03	5.34868E+01
4.08329E+04	7.01078E-03	6.39704E+03	4.48482E+01
4.25705E+04	9.08952E-03	4.39669E+03	3.99637E+01
4.43080E+04	1.37876E-02	3.00677E+03	4.14563E+01
4.60456E+04	2.54397E-02	2.04677E+03	5.20692E+01
4.77832E+04	4.57185E-02	1.38734E+03	6.34271E+01
4.95207E+04	8.77473E-02	9.36639E+02	8.21876E+01
5.12583E+04	1.76176E-01	6.30024E+02	1.10995E+02
5.29959E+04	3.50305E-01	4.22322E+02	1.47941E+02
5.47335E+04	7.02417E-01	2.82182E+02	1.98209E+02
5.64710E+04	1.47559E+00	1.87975E+02	2.77374E+02
5.82086E+04	3.24640E+00	1.24864E+02	4.05358E+02
5.99462E+04	6.28724E+00	8.27206E+01	5.20084E+02
6.16837E+04	8.69573E+00	5.46631E+01	4.75336E+02
6.34213E+04	1.13276E+01	3.60364E+01	4.08205E+02
6.51589E+04	1.50224E+01	2.37033E+01	3.56080E+02
6.68964E+04	1.76072E+01	1.55579E+01	2.73931E+02

J TOTAL = 1.30557E+08

PLANCK MEAN OPACITY = 1.41232E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 4.72750E-03
ROSSELAND MEAN-FREE-PATH = 8.43100E+01 1/ROSSELAND MEAN-FREE-PATH = 1.18610E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 8.11427E+03 I PRIME = 1.13592E+04

TEMPERATURE = 5.00000E+03 SI/H MASS RATIO = 1.00000E-02 PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.87021E-02	6.70766E+05	1.25447E+04
9.55663E+03	2.18267E-02	7.09896E+05	1.54947E+04
1.12942E+04	2.30624E-02	6.92124E+05	1.59620E+04
1.30318E+04	2.29579E-02	6.34807E+05	1.45738E+04
1.47693E+04	2.20775E-02	5.55228E+05	1.22580E+04
1.65069E+04	2.08388E-02	4.67491E+05	9.74194E+03
1.82445E+04	1.92617E-02	3.81535E+05	7.34901E+03
1.99821E+04	1.74088E-02	3.03398E+05	5.28179E+03
2.17196E+04	1.57433E-02	2.36024E+05	3.71581E+03
2.34572E+04	3.36331E-02	1.80198E+05	6.06063E+03
2.51948E+04	1.21231E-02	1.35365E+05	1.64105E+03
2.69323E+04	1.05895E-02	1.00260E+05	1.06171E+03
2.86699E+04	1.16234E-02	7.33441E+04	8.52511E+02
3.04075E+04	2.67671E-02	5.30684E+04	1.42049E+03
3.21450E+04	7.32174E-03	3.80245E+04	2.78405E+02
3.38826E+04	6.77817E-03	2.70078E+04	1.83063E+02
3.56202E+04	6.53819E-03	1.90322E+04	1.24436E+02
3.73578E+04	6.64010E-03	1.33165E+04	8.84230E+01
3.90953E+04	7.16434E-03	9.25704E+03	6.63206E+01
4.08329E+04	8.30297E-03	6.39704E+03	5.31144E+01
4.25705E+04	1.03159E-02	4.39669E+03	4.53558E+01
4.43080E+04	1.53620E-02	3.00677E+03	4.61900E+01
4.60456E+04	2.96318E-02	2.04677E+03	6.06496E+01
4.77832E+04	5.18452E-02	1.38734E+03	7.19269E+01
4.95207E+04	9.52061E-02	9.36639E+02	8.91737E+01
5.12583E+04	1.91345E-01	6.30024E+02	1.20552E+02
5.29959E+04	3.71441E-01	4.22322E+02	1.56868E+02
5.47335E+04	7.20815E-01	2.82182E+02	2.03401E+02
5.64710E+04	1.52385E+00	1.87975E+02	2.86445E+02
5.82086E+04	3.37602E+00	1.24864E+02	4.21544E+02
5.99462E+04	6.59326E+00	8.27206E+01	5.45398E+02
6.16837E+04	9.11853E+00	5.46631E+01	4.98447E+02
6.34213E+04	1.21050E+01	3.60364E+01	4.36221E+02
6.51589E+04	1.68613E+01	2.37033E+01	3.99670E+02
6.68964E+04	2.22022E+01	1.55579E+01	3.45419E+02

J TOTAL = 1.95441E+08

PLANCK MEAN OPACITY = 2.11420E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 6.06409E-03
ROSSELAND MEAN-FREE-PATH = 5.63104E+01 1/ROSSELAND MEAN-FREE-PATH = 1.77587E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 3.75051E+03 I PRIME = 5.48940E+03

TEMPERATURE = 5.00000E+03 SI/H MASS RATIO = 5.00000E-02 PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	5.14908E-02	6.70766E+05	3.45383E+04
9.55663E+03	6.13534E-02	7.09896E+05	4.35545E+04
1.12942E+04	6.67220E-02	6.92124E+05	4.61799E+04
1.30318E+04	6.86734E-02	6.34807E+05	4.35944E+04
1.47693E+04	6.78389E-02	5.55228E+05	3.76661E+04
1.65069E+04	6.52815E-02	4.67491E+05	3.05185E+04
1.82445E+04	6.09632E-02	3.81535E+05	2.32596E+04
1.99821E+04	5.52088E-02	3.03398E+05	1.67502E+04
2.17196E+04	4.95893E-02	2.36024E+05	1.17043E+04
2.34572E+04	1.41552E-01	1.80198E+05	2.55075E+04
2.51948E+04	3.63147E-02	1.35365E+05	4.91574E+03
2.69323E+04	3.02955E-02	1.00260E+05	3.03743E+03
2.86699E+04	3.70780E-02	7.33441E+04	2.71945E+03
3.04075E+04	1.17765E-01	5.30684E+04	6.24961E+03
3.21450E+04	1.79592E-02	3.80245E+04	6.82888E+02
3.38826E+04	1.57922E-02	2.70078E+04	4.26512E+02
3.56202E+04	1.44360E-02	1.90322E+04	2.74749E+02
3.73578E+04	1.37284E-02	1.33165E+04	1.82814E+02
3.90953E+04	1.36527E-02	9.25704E+03	1.26383E+02
4.08329E+04	1.43220E-02	6.39704E+03	9.16184E+01
4.25705E+04	1.60653E-02	4.39669E+03	7.06339E+01
4.43080E+04	2.41808E-02	3.00677E+03	7.27062E+01
4.60456E+04	6.42313E-02	2.04677E+03	1.31467E+02
4.77832E+04	9.73757E-02	1.38734E+03	1.35093E+02
4.95207E+04	1.51519E-01	9.36639E+02	1.41919E+02
5.12583E+04	3.09437E-01	6.30024E+02	1.94952E+02
5.29959E+04	5.37372E-01	4.22322E+02	2.26944E+02
5.47335E+04	8.65187E-01	2.82182E+02	2.44140E+02
5.64710E+04	1.90705E+00	1.87975E+02	3.58478E+02
5.82086E+04	4.41000E+00	1.24864E+02	5.50651E+02
5.99462E+04	9.03775E+00	8.27206E+01	7.47608E+02
6.16837E+04	1.24969E+01	5.46631E+01	6.83120E+02
6.34213E+04	1.83192E+01	3.60364E+01	6.60156E+02
6.51589E+04	3.15633E+01	2.37033E+01	7.48154E+02
6.68964E+04	5.89408E+01	1.55579E+01	9.16995E+02

J TOTAL = 5.87061E+08

PLANCK MEAN OPACITY = 6.35061E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 2.46879E-02
ROSSELAND MEAN-FREE-PATH = 1.94148E+01 1/ROSSELAND MEAN-FREE-PATH = 5.15072E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 5.11755E+02 I PRIME = 8.60964E+02

TEMPERATURE = 5.00000E+03 SI/H MASS RATIO = 0. PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	8.92658E-09	6.70766E+05	5.98765E-03
9.55663E+03	1.85588E-08	7.09896E+05	1.31748E-02
1.12942E+04	1.79426E-08	6.92124E+05	1.24185E-02
1.30318E+04	2.73499E-08	6.34807E+05	1.73619E-02
1.47693E+04	7.08088E-08	5.55228E+05	3.93150E-02
1.65069E+04	9.48362E-07	4.67491E+05	4.43350E-01
1.82445E+04	2.22288E-06	3.81535E+05	8.48107E-01
1.99821E+04	5.15743E-06	3.03398E+05	1.56475E+00
2.17196E+04	1.15651E-05	2.36024E+05	2.72965E+00
2.34572E+04	2.42755E-05	1.80198E+05	4.37440E+00
2.51948E+04	4.90618E-05	1.35365E+05	6.64125E+00
2.69323E+04	9.36808E-05	1.00260E+05	9.39247E+00
2.86699E+04	1.68735E-04	7.33441E+04	1.23757E+01
3.04075E+04	2.94959E-04	5.30684E+04	1.56530E+01
3.21450E+04	5.12321E-04	3.80245E+04	1.94807E+01
3.38826E+04	9.06855E-04	2.70078E+04	2.44921E+01
3.56202E+04	1.61291E-03	1.90322E+04	3.06972E+01
3.73578E+04	2.82663E-03	1.33165E+04	3.76409E+01
3.90953E+04	4.78073E-03	9.25704E+03	4.42554E+01
4.08329E+04	7.95293E-03	6.39704E+03	5.08752E+01
4.25705E+04	1.28747E-02	4.39669E+03	5.66060E+01
4.43080E+04	2.25609E-02	3.00677E+03	6.78354E+01
4.60456E+04	4.26859E-02	2.04677E+03	8.73684E+01
4.77832E+04	8.24571E-02	1.38734E+03	1.14396E+02
4.95207E+04	1.71101E-01	9.36639E+02	1.60260E+02
5.12583E+04	3.46737E-01	6.30024E+02	2.18453E+02
5.29959E+04	7.12414E-01	4.22322E+02	3.00868E+02
5.47335E+04	1.48388E+00	2.82182E+02	4.18724E+02
5.64710E+04	3.09965E+00	1.87975E+02	5.82656E+02
5.82086E+04	6.77183E+00	1.24864E+02	8.45558E+02
5.99462E+04	1.29980E+01	8.27206E+01	1.07520E+03
6.16837E+04	1.79793E+01	5.46631E+01	9.82803E+02
6.34213E+04	2.29290E+01	3.60364E+01	8.26276E+02
6.51589E+04	2.86522E+01	2.37033E+01	6.79154E+02
6.68964E+04	2.82791E+01	1.55579E+01	4.39963E+02

J TOTAL = 1.23675E+07

PLANCK MEAN OPACITY = 1.33787E-03 MEAN-SQUARED PLANCK MEAN OPACITY = 1.71008E-02
ROSSELAND MEAN-FREE-PATH = 2.34819E+07 1/ROSSELAND MEAN-FREE-PATH = 4.25860E-08
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.60743E+15 I PRIME = 5.41561E+14

TEMPERATURE = 5.00000E+03 SI/H MASS RATIO = 5.00000E-03 PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	5.38250E-03	6.70766E+05	3.61040E+03
9.55663E+03	6.97260E-03	7.09896E+05	4.94982E+03
1.12942E+04	8.39721E-03	6.92124E+05	5.81191E+03
1.30318E+04	9.47772E-03	6.34807E+05	6.01652E+03
1.47693E+04	1.00710E-02	5.55228E+05	5.59168E+03
1.65069E+04	1.01140E-02	4.67491E+05	4.72818E+03
1.82445E+04	9.59546E-03	3.81535E+05	3.66100E+03
1.99821E+04	8.61381E-03	3.03398E+05	2.61341E+03
2.17196E+04	7.45976E-03	2.36024E+05	1.76069E+03
2.34572E+04	2.60791E-02	1.80198E+05	4.69942E+03
2.51948E+04	4.58706E-03	1.35365E+05	6.20928E+02
2.69323E+04	3.40460E-03	1.00260E+05	3.41346E+02
2.86699E+04	4.83986E-03	7.33441E+04	3.54975E+02
3.04075E+04	2.05848E-02	5.30684E+04	1.09240E+03
3.21450E+04	1.43328E-03	3.80245E+04	5.44999E+01
3.38826E+04	1.44119E-03	2.70078E+04	3.89234E+01
3.56202E+04	1.91842E-03	1.90322E+04	3.65117E+01
3.73578E+04	2.99762E-03	1.33165E+04	3.99179E+01
3.90953E+04	4.87663E-03	9.25704E+03	4.51431E+01
4.08329E+04	8.00870E-03	6.39704E+03	5.12320E+01
4.25705E+04	1.29386E-02	4.39669E+03	5.68870E+01
4.43080E+04	2.34538E-02	3.00677E+03	7.05200E+01
4.60456E+04	4.87388E-02	2.04677E+03	9.97574E+01
4.77832E+04	9.27284E-02	1.38734E+03	1.28646E+02
4.95207E+04	1.83481E-01	9.36639E+02	1.71855E+02
5.12583E+04	3.72596E-01	6.30024E+02	2.34744E+02
5.29959E+04	7.49006E-01	4.22322E+02	3.16321E+02
5.47335E+04	1.50798E+00	2.82182E+02	4.25524E+02
5.64710E+04	3.16463E+00	1.87975E+02	5.94870E+02
5.82086E+04	6.94845E+00	1.24864E+02	8.67612E+02
5.99462E+04	1.34168E+01	8.27206E+01	1.10985E+03
6.16837E+04	1.85583E+01	5.46631E+01	1.01446E+03
6.34213E+04	2.39959E+01	3.60364E+01	8.64726E+02
6.51589E+04	3.11807E+01	2.37033E+01	7.39087E+02
6.68964E+04	3.46040E+01	1.55579E+01	5.38366E+02

J. TOTAL = 9.27031E+07

PLANCK MEAN OPACITY = 1.00283E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 1.98408E-02
ROSSELAND MEAN-FREE-PATH = 1.45902E+02 1/ROSSELAND MEAN-FREE-PATH = 6.85391E-03
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 3.33949E+04 I PRIME = 5.51942E+04

TEMPERATURE = 5.00000E+03 SI/H MASS RATIO = 1.00000E-02 PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	4.21208E-02	6.70766E+05	2.82532E+04
9.55663E+03	4.70446E-02	7.09896E+05	3.33968E+04
1.12942E+04	4.94251E-02	6.92124E+05	3.42083E+04
1.30318E+04	4.95666E-02	6.34807E+05	3.14652E+04
1.47693E+04	4.81509E-02	5.55228E+05	2.67348E+04
1.65069E+04	4.57545E-02	4.67491E+05	2.13898E+04
1.82445E+04	4.23833E-02	3.81535E+05	1.61707E+04
1.99821E+04	3.81955E-02	3.03398E+05	1.15884E+04
2.17196E+04	3.41459E-02	2.36024E+05	8.05926E+03
2.34572E+04	6.95895E-02	1.80198E+05	1.25399E+04
2.51948E+04	2.53251E-02	1.35365E+05	3.42813E+03
2.69323E+04	2.15806E-02	1.00260E+05	2.16368E+03
2.86699E+04	2.31646E-02	7.33441E+04	1.69899E+03
3.04075E+04	5.34319E-02	5.30684E+04	2.83555E+03
3.21450E+04	1.38963E-02	3.80245E+04	5.28400E+02
3.38826E+04	1.26923E-02	2.70078E+04	3.42790E+02
3.56202E+04	1.22022E-02	1.90322E+04	2.32234E+02
3.73578E+04	1.24896E-02	1.33165E+04	1.66318E+02
3.90953E+04	1.37119E-02	9.25704E+03	1.26931E+02
4.08329E+04	1.62773E-02	6.39704E+03	1.04127E+02
4.25705E+04	2.07390E-02	4.39669E+03	9.11827E+01
4.43080E+04	3.16652E-02	3.00677E+03	9.52098E+01
4.60456E+04	6.19338E-02	2.04677E+03	1.26764E+02
4.77832E+04	1.09528E-01	1.38734E+03	1.51952E+02
4.95207E+04	2.02023E-01	9.36639E+02	1.89223E+02
5.12583E+04	4.04167E-01	6.30024E+02	2.54634E+02
5.29959E+04	7.90918E-01	4.22322E+02	3.34022E+02
5.47335E+04	1.53720E+00	2.82182E+02	4.33770E+02
5.64710E+04	3.23423E+00	1.87975E+02	6.07954E+02
5.82086E+04	7.12871E+00	1.24864E+02	8.90120E+02
5.99462E+04	1.38373E+01	8.27206E+01	1.14463E+03
6.16837E+04	1.91378E+01	5.46631E+01	1.04613E+03
6.34213E+04	2.50596E+01	3.60364E+01	9.03056E+02
6.51589E+04	3.36953E+01	2.37033E+01	7.98690E+02
6.68964E+04	4.08878E+01	1.55579E+01	6.36128E+02

J TOTAL = 4.22467E+08

PLANCK MEAN OPACITY = 4.57009E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 2.47590E-02
ROSSELAND MEAN-FREE-PATH = 2.66355E+01 1/ROSSELAND MEAN-FREE-PATH = 3.75439E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 8.81632E+02 I PRIME = 1.37128E+03

TEMPERATURE = 5.00000E+03 SI/H MASS RATIO = 5.00000E-02 PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.21646E-01	6.70766E+05	8.15960E+04
9.55663E+03	1.41229E-01	7.09896E+05	1.00258E+05
1.12942E+04	1.54379E-01	6.92124E+05	1.06850E+05
1.30318E+04	1.61057E-01	6.34807E+05	1.02240E+05
1.47693E+04	1.61358E-01	5.55228E+05	8.95905E+04
1.65069E+04	1.56554E-01	4.67491E+05	7.31873E+04
1.82445E+04	1.46563E-01	3.81535E+05	5.59190E+04
1.99821E+04	1.32272E-01	3.03398E+05	4.01311E+04
2.17196E+04	1.17134E-01	2.36024E+05	2.76465E+04
2.34572E+04	2.99181E-01	1.80198E+05	5.39118E+04
2.51948E+04	8.20326E-02	1.35365E+05	1.11043E+04
2.69323E+04	6.63353E-02	1.00260E+05	6.65080E+03
2.86699E+04	7.72081E-02	7.33441E+04	5.66276E+03
3.04075E+04	2.37884E-01	5.30684E+04	1.26241E+04
3.21450E+04	3.50360E-02	3.80245E+04	1.33223E+03
3.38826E+04	2.97877E-02	2.70078E+04	8.04500E+02
3.56202E+04	2.66137E-02	1.90322E+04	5.06518E+02
3.73578E+04	2.50626E-02	1.33165E+04	3.33746E+02
3.90953E+04	2.50072E-02	9.25704E+03	2.31492E+02
4.08329E+04	2.66377E-02	6.39704E+03	1.70402E+02
4.25705E+04	3.06076E-02	4.39669E+03	1.34572E+02
4.43080E+04	4.78041E-02	3.00677E+03	1.43736E+02
4.60456E+04	1.29473E-01	2.04677E+03	2.65002E+02
4.77832E+04	1.99425E-01	1.38734E+03	2.76670E+02
4.95207E+04	3.08197E-01	9.36639E+02	2.88669E+02
5.12583E+04	6.17278E-01	6.30024E+02	3.88900E+02
5.29959E+04	1.08913E+00	4.22322E+02	4.59965E+02
5.47335E+04	1.73586E+00	2.82182E+02	4.89829E+02
5.64710E+04	3.75865E+00	1.87975E+02	7.06533E+02
5.82086E+04	8.54319E+00	1.24864E+02	1.06674E+03
5.99462E+04	1.71829E+01	8.27206E+01	1.42138E+03
6.16837E+04	2.37610E+01	5.46631E+01	1.29885E+03
6.34213E+04	3.35732E+01	3.60364E+01	1.20986E+03
6.51589E+04	5.38630E+01	2.37033E+01	1.27673E+03
6.68964E+04	9.13292E+01	1.55579E+01	1.42089E+03

J TOTAL = 1.35808E+09

PLANCK MEAN OPACITY = 1.46912E-01 MEAN-SQUARED PLANCK MEAN OPACITY = 8.05837E-02
ROSSELAND MEAN-FREE-PATH = 8.70486E+00 1/ROSSELAND MEAN-FREE-PATH = 1.14878E-01
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.16755E+02 I PRIME = 2.16796E+02

TEMPERATURE = 6.50000E+03 SI/H MASS RATIO = 0. PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	4.03916E-03	1.22568E+06	4.95073E+03
9.55663E+03	5.28886E-03	1.42535E+06	7.53846E+03
1.12942E+04	5.70457E-03	1.53436E+06	8.75286E+03
1.30318E+04	5.60615E-03	1.55994E+06	8.74526E+03
1.47693E+04	5.28601E-03	1.51710E+06	8.01942E+03
1.65069E+04	4.91345E-03	1.42379E+06	6.99570E+03
1.82445E+04	4.52635E-03	1.29758E+06	5.87332E+03
1.99821E+04	4.13499E-03	1.15384E+06	4.77111E+03
2.17196E+04	3.82892E-03	1.00476E+06	3.84717E+03
2.34572E+04	3.53708E-03	8.59328E+05	3.03951E+03
2.51948E+04	3.29741E-03	7.23521E+05	2.38575E+03
2.69323E+04	3.08470E-03	6.00869E+05	1.85350E+03
2.86699E+04	2.96195E-03	4.92995E+05	1.46023E+03
3.04075E+04	2.82620E-03	4.00152E+05	1.13091E+03
3.21450E+04	2.77302E-03	3.21680E+05	8.92028E+02
3.38826E+04	2.85618E-03	2.56368E+05	7.32235E+02
3.56202E+04	3.09528E-03	2.02726E+05	6.27494E+02
3.73578E+04	3.57096E-03	1.59175E+05	5.68408E+02
3.90953E+04	4.33159E-03	1.24175E+05	5.37877E+02
4.08329E+04	5.59465E-03	9.63011E+04	5.38771E+02
4.25705E+04	7.44931E-03	7.42803E+04	5.53337E+02
4.43080E+04	1.06395E-02	5.70097E+04	6.06556E+02
4.60456E+04	1.65262E-02	4.35534E+04	7.19773E+02
4.77832E+04	2.65550E-02	3.31315E+04	8.79806E+02
4.95207E+04	4.55531E-02	2.51037E+04	1.14355E+03
5.12583E+04	7.71286E-02	1.89509E+04	1.46166E+03
5.29959E+04	1.32917E-01	1.42570E+04	1.89499E+03
5.47335E+04	2.32082E-01	1.06911E+04	2.48121E+03
5.64710E+04	4.25239E-01	7.99288E+03	3.39888E+03
5.82086E+04	7.40682E-01	5.95869E+03	4.41350E+03
5.99462E+04	1.19817E+00	4.43034E+03	5.30830E+03
6.16837E+04	1.38090E+00	3.28571E+03	4.53722E+03
6.34213E+04	1.47706E+00	2.43101E+03	3.59075E+03
6.51589E+04	1.58069E+00	1.79459E+03	2.83670E+03
6.68964E+04	1.33187E+00	1.32196E+03	1.76068E+03

J TOTAL = 1.89130E+08

PLANCK MEAN OPACITY = 6.52412E-03 MEAN-SQUARED PLANCK MEAN OPACITY = 1.84930E-03
ROSSELAND MEAN-FREE-PATH = 2.43352E+02 1/ROSSELAND MEAN-FREE-PATH = 4.10927E-03
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 6.43645E+04 I PRIME = 7.15894E+04

TEMPERATURE = 6.50000E+03 SI/H MASS RATIO = 5.00000E-03 PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	8.34904E-03	1.22568E+06	1.02333E+04
9.55663E+03	1.09287E-02	1.42535E+06	1.55771E+04
1.12942E+04	1.17905E-02	1.53436E+06	1.80908E+04
1.30318E+04	1.15912E-02	1.55994E+06	1.80816E+04
1.47693E+04	1.09298E-02	1.51710E+06	1.65816E+04
1.65069E+04	1.01943E-02	1.42379E+06	1.45144E+04
1.82445E+04	9.40422E-03	1.29758E+06	1.22028E+04
1.99821E+04	8.59154E-03	1.15384E+06	9.91323E+03
2.17196E+04	7.97052E-03	1.00476E+06	8.00849E+03
2.34572E+04	7.61386E-03	8.59328E+05	6.54281E+03
2.51948E+04	6.82500E-03	7.23521E+05	4.93803E+03
2.69323E+04	6.33648E-03	6.00869E+05	3.80740E+03
2.86699E+04	6.00327E-03	4.92995E+05	2.95958E+03
3.04075E+04	5.80656E-03	4.00152E+05	2.32351E+03
3.21450E+04	5.31468E-03	3.21680E+05	1.70963E+03
3.38826E+04	5.21830E-03	2.56368E+05	1.33781E+03
3.56202E+04	5.29671E-03	2.02726E+05	1.07378E+03
3.73578E+04	5.62889E-03	1.59175E+05	8.95979E+02
3.90953E+04	6.26216E-03	1.24175E+05	7.77607E+02
4.08329E+04	7.40965E-03	9.63011E+04	7.13557E+02
4.25705E+04	9.15981E-03	7.42803E+04	6.80393E+02
4.43080E+04	1.22723E-02	5.70097E+04	6.99642E+02
4.60456E+04	1.81525E-02	4.35534E+04	7.90604E+02
4.77832E+04	2.82686E-02	3.31315E+04	9.36581E+02
4.95207E+04	4.77393E-02	2.51037E+04	1.19843E+03
5.12583E+04	8.04459E-02	1.89509E+04	1.52453E+03
5.29959E+04	1.37025E-01	1.42570E+04	1.95356E+03
5.47335E+04	2.38896E-01	1.06911E+04	2.55406E+03
5.64710E+04	4.39470E-01	7.99288E+03	3.51263E+03
5.82086E+04	7.72167E-01	5.95869E+03	4.60111E+03
5.99462E+04	1.26256E+00	4.43034E+03	5.59356E+03
6.16837E+04	1.46884E+00	3.28571E+03	4.82618E+03
6.34213E+04	1.62304E+00	2.43101E+03	3.94562E+03
6.51589E+04	1.86872E+00	1.79459E+03	3.35358E+03
6.68964E+04	1.98432E+00	1.32196E+03	2.62319E+03

J TOTAL = 3.28534E+08

PLANCK MEAN OPACITY = 1.13329E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 2.37860E-03
ROSSELAND MEAN-FREE-PATH = 1.22349E+02 1/ROSSELAND MEAN-FREE-PATH = 8.17334E-03
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.63404E+04 I PRIME = 1.93955E+04

TEMPERATURE = 6.50000E+03 SI/H MASS RATIO = 1.00000E-02 PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.12825E-02	1.22568E+06	1.38288E+04
9.55663E+03	1.47659E-02	1.42535E+06	2.10465E+04
1.12942E+04	1.59311E-02	1.53436E+06	2.44440E+04
1.30318E+04	1.56655E-02	1.55994E+06	2.44373E+04
1.47693E+04	1.47739E-02	1.51710E+06	2.24135E+04
1.65069E+04	1.38054E-02	1.42379E+06	1.96559E+04
1.82445E+04	1.27459E-02	1.29758E+06	1.65389E+04
1.99821E+04	1.16471E-02	1.15384E+06	1.34388E+04
2.17196E+04	1.08203E-02	1.00476E+06	1.08719E+04
2.34572E+04	1.05235E-02	8.59328E+05	9.04313E+03
2.51948E+04	9.25766E-03	7.23521E+05	6.69811E+03
2.69323E+04	8.58060E-03	6.00869E+05	5.15582E+03
2.86699E+04	8.11944E-03	4.92995E+05	4.00285E+03
3.04075E+04	7.95236E-03	4.00152E+05	3.18216E+03
3.21450E+04	7.07039E-03	3.21680E+05	2.27441E+03
3.38826E+04	6.85015E-03	2.56368E+05	1.75616E+03
3.56202E+04	6.81785E-03	2.02726E+05	1.38216E+03
3.73578E+04	7.05106E-03	1.59175E+05	1.12235E+03
3.90953E+04	7.59645E-03	1.24175E+05	9.43292E+02
4.08329E+04	8.66415E-03	9.63011E+04	8.34367E+02
4.25705E+04	1.03423E-02	7.42803E+04	7.68226E+02
4.43080E+04	1.34065E-02	5.70097E+04	7.64297E+02
4.60456E+04	1.93124E-02	4.35534E+04	8.41121E+02
4.77832E+04	2.95506E-02	3.31315E+04	9.79057E+02
4.95207E+04	4.95589E-02	2.51037E+04	1.24411E+03
5.12583E+04	8.35109E-02	1.89509E+04	1.58261E+03
5.29959E+04	1.40968E-01	1.42570E+04	2.00977E+03
5.47335E+04	2.45773E-01	1.06911E+04	2.62758E+03
5.64710E+04	4.54337E-01	7.99288E+03	3.63146E+03
5.82086E+04	8.05588E-01	5.95869E+03	4.80025E+03
5.99462E+04	1.33135E+00	4.43034E+03	5.89833E+03
6.16837E+04	1.56296E+00	3.28571E+03	5.13542E+03
6.34213E+04	1.77951E+00	2.43101E+03	4.32600E+03
6.51589E+04	2.17777E+00	1.79459E+03	3.90821E+03
6.68964E+04	2.68481E+00	1.32196E+03	3.54920E+03

J TOTAL = 4.25941E+08

PLANCK MEAN OPACITY = 1.46930E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 3.05481E-03
ROSSELAND MEAN-FREE-PATH = 9.15547E+01 1/ROSSELAND MEAN-FREE-PATH = 1.09224E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 9.17731E+03 I PRIME = 1.11599E+04

TEMPERATURE = 6.50000E+03 SI/H MASS RATIO = 5.00000E-02 PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	2.46402E-02	1.22568E+06	3.02010E+04
9.55663E+03	3.22206E-02	1.42535E+06	4.59255E+04
1.12942E+04	3.47637E-02	1.53436E+06	5.33400E+04
1.30318E+04	3.42340E-02	1.55994E+06	5.34030E+04
1.47693E+04	3.23170E-02	1.51710E+06	4.90282E+04
1.65069E+04	3.04316E-02	1.42379E+06	4.33280E+04
1.82445E+04	2.81958E-02	1.29758E+06	3.65864E+04
1.99821E+04	2.58007E-02	1.15384E+06	2.97698E+04
2.17196E+04	2.41257E-02	1.00476E+06	2.42406E+04
2.34572E+04	2.51676E-02	8.59328E+05	2.16272E+04
2.51948E+04	2.06725E-02	7.23521E+05	1.49570E+04
2.69323E+04	1.91282E-02	6.00869E+05	1.14935E+04
2.86699E+04	1.82417E-02	4.92995E+05	8.99306E+03
3.04075E+04	1.89466E-02	4.00152E+05	7.58151E+03
3.21450E+04	1.53420E-02	3.21680E+05	4.93522E+03
3.38826E+04	1.45408E-02	2.56368E+05	3.72780E+03
3.56202E+04	1.39907E-02	2.02726E+05	2.83628E+03
3.73578E+04	1.37601E-02	1.59175E+05	2.19027E+03
3.90953E+04	1.38931E-02	1.24175E+05	1.72518E+03
4.08329E+04	1.45861E-02	9.63011E+04	1.40466E+03
4.25705E+04	1.59268E-02	7.42803E+04	1.18304E+03
4.43080E+04	1.88180E-02	5.70097E+04	1.07281E+03
4.60456E+04	2.51624E-02	4.35534E+04	1.09591E+03
4.77832E+04	3.65898E-02	3.31315E+04	1.21228E+03
4.95207E+04	6.12642E-02	2.51037E+04	1.53796E+03
5.12583E+04	1.05775E-01	1.89509E+04	2.00454E+03
5.29959E+04	1.70714E-01	1.42570E+04	2.43386E+03
5.47335E+04	3.00113E-01	1.06911E+04	3.20853E+03
5.64710E+04	5.75295E-01	7.99288E+03	4.59826E+03
5.82086E+04	1.08107E+00	5.95869E+03	6.44176E+03
5.99462E+04	1.90128E+00	4.43034E+03	8.42331E+03
6.16837E+04	2.34372E+00	3.28571E+03	7.70078E+03
6.34213E+04	3.07913E+00	2.43101E+03	7.48539E+03
6.51589E+04	4.74695E+00	1.79459E+03	8.51883E+03
6.68964E+04	8.51061E+00	1.32196E+03	1.12507E+04

J TOTAL = 8.95652E+08

PLANCK MEAN OPACITY = 3.08958E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 1.30380E-02
ROSSELAND MEAN-FREE-PATH = 4.23714E+01 1/ROSSELAND MEAN-FREE-PATH = 2.36008E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.98353E+03 I PRIME = 2.54264E+03

TEMPERATURE = 6.50000E+03 SI/H MASS RATIO = 0. PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	4.03986E-02	1.22568E+06	4.95159E+04
9.55663E+03	4.97502E-02	1.42535E+06	7.09113E+04
1.12942E+04	5.25486E-02	1.53436E+06	8.06285E+04
1.30318E+04	5.11479E-02	1.55994E+06	7.97878E+04
1.47693E+04	4.79463E-02	1.51710E+06	7.27395E+04
1.65069E+04	4.44337E-02	1.42379E+06	6.32640E+04
1.82445E+04	4.08568E-02	1.29758E+06	5.30151E+04
1.99821E+04	3.72937E-02	1.15384E+06	4.30308E+04
2.17196E+04	3.45391E-02	1.00476E+06	3.47037E+04
2.34572E+04	3.19585E-02	8.59328E+05	2.74628E+04
2.51948E+04	2.99113E-02	7.23521E+05	2.16415E+04
2.69323E+04	2.81794E-02	6.00869E+05	1.69321E+04
2.86699E+04	2.70820E-02	4.92995E+05	1.33513E+04
3.04075E+04	2.62713E-02	4.00152E+05	1.05125E+04
3.21450E+04	2.64244E-02	3.21680E+05	8.50023E+03
3.38826E+04	2.83110E-02	2.56368E+05	7.25805E+03
3.56202E+04	3.22315E-02	2.02726E+05	6.53416E+03
3.73578E+04	3.92400E-02	1.59175E+05	6.24603E+03
3.90953E+04	4.99853E-02	1.24175E+05	6.20694E+03
4.08329E+04	6.74006E-02	9.63011E+04	6.49075E+03
4.25705E+04	9.26953E-02	7.42803E+04	6.88543E+03
4.43080E+04	1.35826E-01	5.70097E+04	7.74340E+03
4.60456E+04	2.15050E-01	4.35534E+04	9.36614E+03
4.77832E+04	3.49728E-01	3.31315E+04	1.15870E+04
4.95207E+04	6.04587E-01	2.51037E+04	1.51774E+04
5.12583E+04	1.02796E+00	1.89509E+04	1.94809E+04
5.29959E+04	1.77571E+00	1.42570E+04	2.53162E+04
5.47335E+04	3.10460E+00	1.06911E+04	3.31915E+04
5.64710E+04	5.69270E+00	7.99288E+03	4.55010E+04
5.82086E+04	9.91917E+00	5.95869E+03	5.91053E+04
5.99462E+04	1.60488E+01	4.43034E+03	7.11015E+04
6.16837E+04	1.84971E+01	3.28571E+03	6.07761E+04
6.34213E+04	1.97857E+01	2.43101E+03	4.80992E+04
6.51589E+04	2.11743E+01	1.79459E+03	3.79992E+04
6.68964E+04	1.78408E+01	1.32196E+03	2.35847E+04

J TOTAL = 2.00454E+09

PLANCK MEAN OPACITY = 6.91474E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 3.29777E-01
ROSSELAND MEAN-FREE-PATH = 2.60742E+01 1/ROSSELAND MEAN-FREE-PATH = 3.83521E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 7.41489E+02 I PRIME = 8.03399E+02

TEMPERATURE = 6.50000E+03 SI/H MASS RATIO = 5.00000E-03 PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	8.18965E-02	1.22568E+06	1.00379E+05
9.55663E+03	1.00838E-01	1.42535E+06	1.43729E+05
1.12942E+04	1.06541E-01	1.53436E+06	1.63473E+05
1.30318E+04	1.03766E-01	1.55994E+06	1.61869E+05
1.47693E+04	9.73143E-02	1.51710E+06	1.47636E+05
1.65069E+04	9.03955E-02	1.42379E+06	1.28704E+05
1.82445E+04	8.31870E-02	1.29758E+06	1.07942E+05
1.99821E+04	7.58956E-02	1.15384E+06	8.75711E+04
2.17196E+04	7.03523E-02	1.00476E+06	7.06875E+04
2.34572E+04	7.05246E-02	8.59328E+05	6.06038E+04
2.51948E+04	6.02565E-02	7.23521E+05	4.35968E+04
2.69323E+04	5.61317E-02	6.00869E+05	3.37278E+04
2.86699E+04	5.37516E-02	4.92995E+05	2.64993E+04
3.04075E+04	5.48685E-02	4.00152E+05	2.19558E+04
3.21450E+04	4.81766E-02	3.21680E+05	1.54975E+04
3.38826E+04	4.85065E-02	2.56368E+05	1.24355E+04
3.56202E+04	5.10394E-02	2.02726E+05	1.03470E+04
3.73578E+04	5.68113E-02	1.59175E+05	9.04294E+03
3.90953E+04	6.64605E-02	1.24175E+05	8.25276E+03
4.08329E+04	8.28816E-02	9.63011E+04	7.98159E+03
4.25705E+04	1.07285E-01	7.42803E+04	7.96914E+03
4.43080E+04	1.49944E-01	5.70097E+04	8.54823E+03
4.60456E+04	2.30079E-01	4.35534E+04	1.00207E+04
4.77832E+04	3.65518E-01	3.31315E+04	1.21102E+04
4.95207E+04	6.23582E-01	2.51037E+04	1.56542E+04
5.12583E+04	1.05583E+00	1.89509E+04	2.00090E+04
5.29959E+04	1.80851E+00	1.42570E+04	2.57839E+04
5.47335E+04	3.14799E+00	1.06911E+04	3.36554E+04
5.64710E+04	5.78004E+00	7.99288E+03	4.61992E+04
5.82086E+04	1.01094E+01	5.95869E+03	6.02388E+04
5.99462E+04	1.64356E+01	4.43034E+03	7.28156E+04
6.16837E+04	1.90252E+01	3.28571E+03	6.25111E+04
6.34213E+04	2.06626E+01	2.43101E+03	5.02309E+04
6.51589E+04	2.29055E+01	1.79459E+03	4.11061E+04
6.68964E+04	2.17653E+01	1.32196E+03	2.87729E+04

J TOTAL = 3.22763E+09

PLANCK MEAN OPACITY = 1.11338E-01 MEAN-SQUARED PLANCK MEAN OPACITY = 3.70337E-01
ROSSELAND MEAN-FREE-PATH = 1.33523E+01 1/ROSSELAND MEAN-FREE-PATH = 7.48934E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.94418E+02 I PRIME = 2.24668E+02

TEMPERATURE = 6.50000E+03 SI/H MASS RATIO = 1.00000E-02 PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.09459E-01	1.22568E+06	1.34161E+05
9.55663E+03	1.34760E-01	1.42535E+06	1.92079E+05
1.12942E+04	1.42398E-01	1.53436E+06	2.18490E+05
1.30318E+04	1.38746E-01	1.55994E+06	2.16435E+05
1.47693E+04	1.30157E-01	1.51710E+06	1.97461E+05
1.65069E+04	1.21060E-01	1.42379E+06	1.72364E+05
1.82445E+04	1.11469E-01	1.29758E+06	1.44640E+05
1.99821E+04	1.01703E-01	1.15384E+06	1.17349E+05
2.17196E+04	9.43728E-02	1.00476E+06	9.48224E+04
2.34572E+04	9.84371E-02	8.59328E+05	8.45898E+04
2.51948E+04	8.06152E-02	7.23521E+05	5.83268E+04
2.69323E+04	7.48970E-02	6.00869E+05	4.50033E+04
2.86699E+04	7.19890E-02	4.92995E+05	3.54902E+04
3.04075E+04	7.58660E-02	4.00152E+05	3.03580E+04
3.21450E+04	6.27683E-02	3.21680E+05	2.01913E+04
3.38826E+04	6.20506E-02	2.56368E+05	1.59078E+04
3.56202E+04	6.36522E-02	2.02726E+05	1.29040E+04
3.73578E+04	6.85942E-02	1.59175E+05	1.09185E+04
3.90953E+04	7.75079E-02	1.24175E+05	9.62457E+03
4.08329E+04	9.32614E-02	9.63011E+04	8.98118E+03
4.25705E+04	1.17069E-01	7.42803E+04	8.69594E+03
4.43080E+04	1.59524E-01	5.70097E+04	9.09443E+03
4.60456E+04	2.40872E-01	4.35534E+04	1.04908E+04
4.77832E+04	3.77314E-01	3.31315E+04	1.25010E+04
4.95207E+04	6.38919E-01	2.51037E+04	1.60392E+04
5.12583E+04	1.08056E+00	1.89509E+04	2.04776E+04
5.29959E+04	1.83855E+00	1.42570E+04	2.62121E+04
5.47335E+04	3.18915E+00	1.06911E+04	3.40955E+04
5.64710E+04	5.86668E+00	7.99288E+03	4.68917E+04
5.82086E+04	1.03022E+01	5.95869E+03	6.13879E+04
5.99462E+04	1.68314E+01	4.43034E+03	7.45689E+04
6.16837E+04	1.95666E+01	3.28571E+03	6.42900E+04
6.34213E+04	2.15637E+01	2.43101E+03	5.24215E+04
6.51589E+04	2.46873E+01	1.79459E+03	4.43036E+04
6.68964E+04	2.58079E+01	1.32196E+03	3.41170E+04

J TOTAL = 4.05842E+09

PLANCK MEAN OPACITY = 1.39996E-01 MEAN-SQUARED PLANCK MEAN OPACITY = 4.15740E-01
ROSSELAND MEAN-FREE-PATH = 1.00994E+01 1/ROSSELAND MEAN-FREE-PATH = 9.90162E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.11471E+02 I PRIME = 1.32067E+02

TEMPERATURE = 6.50000E+03 SI/H MASS RATIO = 5.00000E-02 PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	2.34503E-01	1.22568E+06	2.87426E+05
9.55663E+03	2.88537E-01	1.42535E+06	4.11266E+05
1.12942E+04	3.05000E-01	1.53436E+06	4.67979E+05
1.30318E+04	2.97894E-01	1.55994E+06	4.64697E+05
1.47693E+04	2.79833E-01	1.51710E+06	4.24536E+05
1.65069E+04	2.61721E-01	1.42379E+06	3.72634E+05
1.82445E+04	2.41630E-01	1.29758E+06	3.13535E+05
1.99821E+04	2.20676E-01	1.15384E+06	2.54624E+05
2.17196E+04	2.05898E-01	1.00476E+06	2.06879E+05
2.34572E+04	2.48435E-01	8.59328E+05	2.13488E+05
2.51948E+04	1.75236E-01	7.23521E+05	1.26787E+05
2.69323E+04	1.62226E-01	6.00869E+05	9.74763E+04
2.86699E+04	1.60200E-01	4.92995E+05	7.89780E+04
3.04075E+04	1.91766E-01	4.00152E+05	7.67357E+04
3.21450E+04	1.30587E-01	3.21680E+05	4.20073E+04
3.38826E+04	1.24978E-01	2.56368E+05	3.20404E+04
3.56202E+04	1.22260E-01	2.02726E+05	2.47853E+04
3.73578E+04	1.23353E-01	1.59175E+05	1.96347E+04
3.90953E+04	1.28853E-01	1.24175E+05	1.60004E+04
4.08329E+04	1.41506E-01	9.63011E+04	1.36272E+04
4.25705E+04	1.62581E-01	7.42803E+04	1.20766E+04
4.43080E+04	2.05234E-01	5.70097E+04	1.17003E+04
4.60456E+04	2.98562E-01	4.35534E+04	1.30034E+04
4.77832E+04	4.44192E-01	3.31315E+04	1.47168E+04
4.95207E+04	7.36146E-01	2.51037E+04	1.84800E+04
5.12583E+04	1.25569E+00	1.89509E+04	2.37965E+04
5.29959E+04	2.05829E+00	1.42570E+04	2.93450E+04
5.47335E+04	3.50090E+00	1.06911E+04	3.74284E+04
5.64710E+04	6.54934E+00	7.99288E+03	5.23481E+04
5.82086E+04	1.18497E+01	5.95869E+03	7.06088E+04
5.99462E+04	2.00303E+01	4.43034E+03	8.87410E+04
6.16837E+04	2.39510E+01	3.28571E+03	7.86961E+04
6.34213E+04	2.88742E+01	2.43101E+03	7.01935E+04
6.51589E+04	3.91609E+01	1.79459E+03	7.02777E+04
6.68964E+04	5.86676E+01	1.32196E+03	7.75560E+04

J TOTAL = 8.01733E+09

PLANCK MEAN OPACITY = 2.76560E-01 MEAN-SQUARED PLANCK MEAN OPACITY = 9.24006E-01
ROSSELAND MEAN-FREE-PATH = 4.76630E+00 1/ROSSELAND MEAN-FREE-PATH = 2.09806E-01
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 2.51326E+01 I PRIME = 3.16010E+01

TEMPERATURE = 6.50000E+03 SI/H MASS RATIO = 0. PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.13839E-01	1.22568E+06	1.39531E+05
9.55663E+03	1.33952E-01	1.42535E+06	1.90928E+05
1.12942E+04	1.39120E-01	1.53436E+06	2.13461E+05
1.30318E+04	1.34343E-01	1.55994E+06	2.09568E+05
1.47693E+04	1.25360E-01	1.51710E+06	1.90184E+05
1.65069E+04	1.15852E-01	1.42379E+06	1.64948E+05
1.82445E+04	1.06326E-01	1.29758E+06	1.37967E+05
1.99821E+04	9.69300E-02	1.15384E+06	1.11841E+05
2.17196E+04	8.96832E-02	1.00476E+06	9.01105E+04
2.34572E+04	8.29295E-02	8.59328E+05	7.12637E+04
2.51948E+04	7.75899E-02	7.23521E+05	5.61380E+04
2.69323E+04	7.30950E-02	6.00869E+05	4.39205E+04
2.86699E+04	7.00957E-02	4.92995E+05	3.45568E+04
3.04075E+04	6.80470E-02	4.00152E+05	2.72292E+04
3.21450E+04	6.85336E-02	3.21680E+05	2.20459E+04
3.38826E+04	7.36026E-02	2.56368E+05	1.88694E+04
3.56202E+04	8.40464E-02	2.02726E+05	1.70384E+04
3.73578E+04	1.02638E-01	1.59175E+05	1.63374E+04
3.90953E+04	1.31089E-01	1.24175E+05	1.62780E+04
4.08329E+04	1.77151E-01	9.63011E+04	1.70599E+04
4.25705E+04	2.44023E-01	7.42803E+04	1.81261E+04
4.43080E+04	3.58005E-01	5.70097E+04	2.04097E+04
4.60456E+04	5.67326E-01	4.35534E+04	2.47090E+04
4.77832E+04	9.23136E-01	3.31315E+04	3.05849E+04
4.95207E+04	1.59642E+00	2.51037E+04	4.00761E+04
5.12583E+04	2.71488E+00	1.89509E+04	5.14495E+04
5.29959E+04	4.69020E+00	1.42570E+04	6.68680E+04
5.47335E+04	8.20069E+00	1.06911E+04	8.76743E+04
5.64710E+04	1.50376E+01	7.99288E+03	1.20194E+05
5.82086E+04	2.62025E+01	5.95869E+03	1.56132E+05
5.99462E+04	4.23948E+01	4.43034E+03	1.87823E+05
6.16837E+04	4.88625E+01	3.28571E+03	1.60548E+05
6.34213E+04	5.22665E+01	2.43101E+03	1.27060E+05
6.51589E+04	5.59348E+01	1.79459E+03	1.00380E+05
6.68964E+04	4.71287E+01	1.32196E+03	6.23021E+04

J TOTAL = 5.28849E+09

PLANCK MEAN OPACITY = 1.82428E-01 MEAN-SQUARED PLANCK MEAN OPACITY = 2.30120E+00
ROSSELAND MEAN-FREE-PATH = 9.97795E+00 1/ROSSELAND MEAN-FREE-PATH = 1.00221E-01
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.08979E+02 I PRIME = 1.18899E+02

TEMPERATURE = 6.50000E+03 SI/H MASS RATIO = 5.00000E-03 PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	2.08229E-01	1.22568E+06	2.55223E+05
9.55663E+03	2.45043E-01	1.42535E+06	3.49271E+05
1.12942E+04	2.54646E-01	1.53436E+06	3.90719E+05
1.30318E+04	2.46157E-01	1.55994E+06	3.83991E+05
1.47693E+04	2.29900E-01	1.51710E+06	3.48782E+05
1.65069E+04	2.12947E-01	1.42379E+06	3.03191E+05
1.82445E+04	1.95609E-01	1.29758E+06	2.53819E+05
1.99821E+04	1.78249E-01	1.15384E+06	2.05671E+05
2.17196E+04	1.65095E-01	1.00476E+06	1.65882E+05
2.34572E+04	1.70193E-01	8.59328E+05	1.46252E+05
2.51948E+04	1.41218E-01	7.23521E+05	1.02174E+05
2.69323E+04	1.31650E-01	6.00869E+05	7.91043E+04
2.86699E+04	1.26908E-01	4.92995E+05	6.25650E+04
3.04075E+04	1.33357E-01	4.00152E+05	5.33633E+04
3.21450E+04	1.13879E-01	3.21680E+05	3.66327E+04
3.38826E+04	1.15652E-01	2.56368E+05	2.96496E+04
3.56202E+04	1.23173E-01	2.02726E+05	2.49703E+04
3.73578E+04	1.39167E-01	1.59175E+05	2.21518E+04
3.90953E+04	1.65320E-01	1.24175E+05	2.05287E+04
4.08329E+04	2.09301E-01	9.63011E+04	2.01560E+04
4.25705E+04	2.74322E-01	7.42803E+04	2.03767E+04
4.43080E+04	3.87677E-01	5.70097E+04	2.21013E+04
4.60456E+04	6.00707E-01	4.35534E+04	2.61628E+04
4.77832E+04	9.58681E-01	3.31315E+04	3.17625E+04
4.95207E+04	1.63919E+00	2.51037E+04	4.11497E+04
5.12583E+04	2.77897E+00	1.89509E+04	5.26641E+04
5.29959E+04	4.76464E+00	1.42570E+04	6.79293E+04
5.47335E+04	8.28671E+00	1.06911E+04	8.85939E+04
5.64710E+04	1.52096E+01	7.99288E+03	1.21568E+05
5.82086E+04	2.65765E+01	5.95869E+03	1.58361E+05
5.99462E+04	4.31554E+01	4.43034E+03	1.91193E+05
6.16837E+04	4.99010E+01	3.28571E+03	1.63960E+05
6.34213E+04	5.39931E+01	2.43101E+03	1.31258E+05
6.51589E+04	5.93470E+01	1.79459E+03	1.06504E+05
6.68964E+04	5.48701E+01	1.32196E+03	7.25359E+04

J TOTAL = 7.90632E+09

PLANCK MEAN OPACITY = 2.72731E-01 MEAN-SQUARED PLANCK MEAN OPACITY = 2.51066E+00
ROSSELAND MEAN-FREE-PATH = 5.60005E+00 1/ROSSELAND MEAN-FREE-PATH = 1.78570E-01
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 3.42688E+01 I PRIME = 3.94552E+01

TEMPERATURE = 6.50000E+03 SI/H MASS RATIO = 1.00000E-02 PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	2.72820E-01	1.22568E+06	3.34391E+05
9.55663E+03	3.21062E-01	1.42535E+06	4.57624E+05
1.12942E+04	3.33741E-01	1.53436E+06	5.12078E+05
1.30318E+04	3.22826E-01	1.55994E+06	5.03590E+05
1.47693E+04	3.01660E-01	1.51710E+06	4.57649E+05
1.65069E+04	2.79782E-01	1.42379E+06	3.98349E+05
1.82445E+04	2.57155E-01	1.29758E+06	3.33680E+05
1.99821E+04	2.34343E-01	1.15384E+06	2.70394E+05
2.17196E+04	2.17278E-01	1.00476E+06	2.18313E+05
2.34572E+04	2.36485E-01	8.59328E+05	2.03219E+05
2.51948E+04	1.85201E-01	7.23521E+05	1.33997E+05
2.69323E+04	1.72140E-01	6.00869E+05	1.03434E+05
2.86699E+04	1.67146E-01	4.92995E+05	8.24023E+04
3.04075E+04	1.83749E-01	4.00152E+05	7.35277E+04
3.21450E+04	1.45158E-01	3.21680E+05	4.66944E+04
3.38826E+04	1.44638E-01	2.56368E+05	3.70807E+04
3.56202E+04	1.50135E-01	2.02726E+05	3.04362E+04
3.73578E+04	1.64332E-01	1.59175E+05	2.61575E+04
3.90953E+04	1.88898E-01	1.24175E+05	2.34564E+04
4.08329E+04	2.31441E-01	9.63011E+04	2.22880E+04
4.25705E+04	2.95193E-01	7.42803E+04	2.19270E+04
4.43080E+04	4.08450E-01	5.70097E+04	2.32856E+04
4.60456E+04	6.25800E-01	4.35534E+04	2.72557E+04
4.77832E+04	9.86371E-01	3.31315E+04	3.26799E+04
4.95207E+04	1.67469E+00	2.51037E+04	4.20409E+04
5.12583E+04	2.83666E+00	1.89509E+04	5.37574E+04
5.29959E+04	4.83330E+00	1.42570E+04	6.89081E+04
5.47335E+04	8.36757E+00	1.06911E+04	8.94584E+04
5.64710E+04	1.53784E+01	7.99288E+03	1.22918E+05
5.82086E+04	2.69514E+01	5.95869E+03	1.60595E+05
5.99462E+04	4.39245E+01	4.43034E+03	1.94601E+05
6.16837E+04	5.09537E+01	3.28571E+03	1.67419E+05
6.34213E+04	5.57471E+01	2.43101E+03	1.35522E+05
6.51589E+04	6.28187E+01	1.79459E+03	1.12734E+05
6.68964E+04	6.27528E+01	1.32196E+03	8.29566E+04

J TOTAL = 9.73876E+09

PLANCK MEAN OPACITY = 3.35942E-01 MEAN-SQUARED PLANCK MEAN OPACITY = 2.73770E+00
ROSSELAND MEAN-FREE-PATH = 4.30986E+00 1/ROSSELAND MEAN-FREE-PATH = 2.32026E-01
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 2.03402E+01 I PRIME = 2.39789E+01

TEMPERATURE = 6.50000E+03 SI/H MASS RATIO = 5.00000E-02 PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	5.73854E-01	1.22568E+06	7.03362E+05
9.55663E+03	6.75274E-01	1.42535E+06	9.62499E+05
1.12942E+04	7.02677E-01	1.53436E+06	1.07816E+06
1.30318E+04	6.82089E-01	1.55994E+06	1.06402E+06
1.47693E+04	6.38772E-01	1.51710E+06	9.69083E+05
1.65069E+04	5.95749E-01	1.42379E+06	8.48219E+05
1.82445E+04	5.49119E-01	1.29758E+06	7.12528E+05
1.99821E+04	5.00920E-01	1.15384E+06	5.77979E+05
2.17196E+04	4.67030E-01	1.00476E+06	4.69255E+05
2.34572E+04	6.14512E-01	8.59328E+05	5.28067E+05
2.51948E+04	3.95361E-01	7.23521E+05	2.86052E+05
2.69323E+04	3.65715E-01	6.00869E+05	2.19747E+05
2.86699E+04	3.69383E-01	4.92995E+05	1.82104E+05
3.04075E+04	4.79390E-01	4.00152E+05	1.91829E+05
3.21450E+04	2.93933E-01	3.21680E+05	9.45526E+04
3.38826E+04	2.82344E-01	2.56368E+05	7.23841E+04
3.56202E+04	2.78165E-01	2.02726E+05	5.63913E+04
3.73578E+04	2.83794E-01	1.59175E+05	4.51729E+04
3.90953E+04	3.00800E-01	1.24175E+05	3.73519E+04
4.08329E+04	3.36500E-01	9.63011E+04	3.24053E+04
4.25705E+04	3.94327E-01	7.42803E+04	2.92907E+04
4.43080E+04	5.10624E-01	5.70097E+04	2.91105E+04
4.60456E+04	7.68044E-01	4.35534E+04	3.34509E+04
4.77832E+04	1.15094E+00	3.31315E+04	3.81324E+04
4.95207E+04	1.90561E+00	2.51037E+04	4.78379E+04
5.12583E+04	3.25023E+00	1.89509E+04	6.15950E+04
5.29959E+04	5.33851E+00	1.42570E+04	7.61108E+04
5.47335E+04	8.97468E+00	1.06911E+04	9.59491E+04
5.64710E+04	1.66992E+01	7.99288E+03	1.33475E+05
5.82086E+04	2.99419E+01	5.95869E+03	1.78414E+05
5.99462E+04	5.01076E+01	4.43034E+03	2.21994E+05
6.16837E+04	5.94325E+01	3.28571E+03	1.95278E+05
6.34213E+04	6.99021E+01	2.43101E+03	1.69932E+05
6.51589E+04	9.08724E+01	1.79459E+03	1.63079E+05
6.68964E+04	1.26497E+02	1.32196E+03	1.67223E+05

J TOTAL = 1.87172E+10

PLANCK MEAN OPACITY = 6.45655E-01 MEAN-SQUARED PLANCK MEAN OPACITY = 5.10335E+00
ROSSELAND MEAN-FREE-PATH = 2.06389E+00 1/ROSSELAND MEAN-FREE-PATH = 4.84521E-01
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 4.73852E+00 I PRIME = 5.94323E+00

TEMPERATURE = 8.00000E+03 SI/H MASS RATIO = 0. PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	2.30780E-02	1.84809E+06	4.26503E+04
9.55663E+03	2.86952E-02	2.27081E+06	6.51613E+04
1.12942E+04	3.04988E-02	2.59042E+06	7.90048E+04
1.30318E+04	2.99597E-02	2.79800E+06	8.38270E+04
1.47693E+04	2.85352E-02	2.89737E+06	8.26769E+04
1.65069E+04	2.65490E-02	2.90059E+06	7.70080E+04
1.82445E+04	2.44957E-02	2.82424E+06	6.91816E+04
1.99821E+04	2.24051E-02	2.68647E+06	6.01906E+04
2.17196E+04	2.07506E-02	2.50506E+06	5.19815E+04
2.34572E+04	1.91561E-02	2.29608E+06	4.39840E+04
2.51948E+04	1.77966E-02	2.07317E+06	3.68955E+04
2.69323E+04	1.65375E-02	1.84732E+06	3.05501E+04
2.86699E+04	1.67639E-02	1.62689E+06	2.72730E+04
3.04075E+04	1.56971E-02	1.41785E+06	2.22560E+04
3.21450E+04	1.48959E-02	1.22411E+06	1.82342E+04
3.38826E+04	1.43384E-02	1.04793E+06	1.50256E+04
3.56202E+04	1.41440E-02	8.90243E+05	1.25916E+04
3.73578E+04	1.43566E-02	7.51022E+05	1.07822E+04
3.90953E+04	1.50683E-02	6.29546E+05	9.48618E+03
4.08329E+04	1.67023E-02	5.24642E+05	8.76274E+03
4.25705E+04	1.87634E-02	4.34876E+05	8.15975E+03
4.43080E+04	2.29686E-02	3.58687E+05	8.23855E+03
4.60456E+04	3.06775E-02	2.94494E+05	9.03432E+03
4.77832E+04	4.19619E-02	2.40763E+05	1.01029E+04
4.95207E+04	5.87261E-02	1.96060E+05	1.15138E+04
5.12583E+04	9.12118E-02	1.59070E+05	1.45090E+04
5.29959E+04	1.38464E-01	1.28615E+05	1.78086E+04
5.47335E+04	2.14168E-01	1.03657E+05	2.22000E+04
5.64710E+04	3.47831E-01	8.32903E+04	2.89709E+04
5.82086E+04	5.40154E-01	6.67356E+04	3.60475E+04
5.99462E+04	7.82853E-01	5.33286E+04	4.17485E+04
6.16837E+04	8.06251E-01	4.25078E+04	3.42720E+04
6.34213E+04	7.78287E-01	3.38021E+04	2.63077E+04
6.51589E+04	7.49530E-01	2.68189E+04	2.01016E+04
6.68964E+04	5.76227E-01	2.12330E+04	1.22350E+04

J TOTAL = 1.99607E+09

PLANCK MEAN OPACITY = 2.87958E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 4.08432E-03
ROSSELAND MEAN-FREE-PATH = 4.83978E+01 1/ROSSELAND MEAN-FREE-PATH = 2.06621E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 2.59771E+03 I PRIME = 2.76738E+03

TEMPERATURE = 8.00000E+03 SI/H MASS RATIO = 5.00000E-03 PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	2.66921E-02	1.84809E+06	4.93295E+04
9.55663E+03	3.31647E-02	2.27081E+06	7.53106E+04
1.12942E+04	3.52698E-02	2.59042E+06	9.13637E+04
1.30318E+04	3.46613E-02	2.79800E+06	9.69822E+04
1.47693E+04	3.30051E-02	2.89737E+06	9.56279E+04
1.65069E+04	3.08750E-02	2.90059E+06	8.95560E+04
1.82445E+04	2.85513E-02	2.82424E+06	8.06355E+04
1.99821E+04	2.61366E-02	2.68647E+06	7.02153E+04
2.17196E+04	2.42857E-02	2.50506E+06	6.08372E+04
2.34572E+04	2.25286E-02	2.29608E+06	5.17275E+04
2.51948E+04	2.08573E-02	2.07317E+06	4.32408E+04
2.69323E+04	1.93662E-02	1.84732E+06	3.57756E+04
2.86699E+04	1.93930E-02	1.62689E+06	3.15503E+04
3.04075E+04	1.81595E-02	1.41785E+06	2.57473E+04
3.21450E+04	1.71221E-02	1.22411E+06	2.09593E+04
3.38826E+04	1.64093E-02	1.04793E+06	1.71957E+04
3.56202E+04	1.60760E-02	8.90243E+05	1.43115E+04
3.73578E+04	1.61638E-02	7.51022E+05	1.21394E+04
3.90953E+04	1.67645E-02	6.29546E+05	1.05540E+04
4.08329E+04	1.82982E-02	5.24642E+05	9.60003E+03
4.25705E+04	2.02679E-02	4.34876E+05	8.81403E+03
4.43080E+04	2.43959E-02	3.58687E+05	8.75052E+03
4.60456E+04	3.20633E-02	2.94494E+05	9.44243E+03
4.77832E+04	4.35336E-02	2.40763E+05	1.04813E+04
4.95207E+04	6.08292E-02	1.96060E+05	1.19261E+04
5.12583E+04	9.42109E-02	1.59070E+05	1.49861E+04
5.29959E+04	1.42236E-01	1.28615E+05	1.82937E+04
5.47335E+04	2.20527E-01	1.03657E+05	2.28592E+04
5.64710E+04	3.60021E-01	8.32903E+04	2.99863E+04
5.82086E+04	5.64501E-01	6.67356E+04	3.76723E+04
5.99462E+04	8.28528E-01	5.33286E+04	4.41843E+04
6.16837E+04	8.68554E-01	4.25078E+04	3.69204E+04
6.34213E+04	8.75436E-01	3.38021E+04	2.95916E+04
6.51589E+04	9.20104E-01	2.68189E+04	2.46762E+04
6.68964E+04	9.36098E-01	2.12330E+04	1.98762E+04

J TOTAL = 2.27816E+09

PLANCK MEAN OPACITY = 3.28653E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 5.16568E-03
ROSSELAND MEAN-FREE-PATH = 4.21458E+01 1/ROSSELAND MEAN-FREE-PATH = 2.37272E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.97036E+03 I PRIME = 2.13408E+03

TEMPERATURE = 8.00000E+03 SI/H MASS RATIO = 1.00000E-02 PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	3.01251E-02	1.84809E+06	5.56740E+04
9.55663E+03	3.74069E-02	2.27081E+06	8.49438E+04
1.12942E+04	3.97974E-02	2.59042E+06	1.03092E+05
1.30318E+04	3.91248E-02	2.79800E+06	1.09471E+05
1.47693E+04	3.72521E-02	2.89737E+06	1.07933E+05
1.65069E+04	3.50063E-02	2.90059E+06	1.01539E+05
1.82445E+04	3.24319E-02	2.82424E+06	9.15953E+04
1.99821E+04	2.97098E-02	2.68647E+06	7.98146E+04
2.17196E+04	2.76810E-02	2.50506E+06	6.93427E+04
2.34572E+04	2.57822E-02	2.29608E+06	5.91981E+04
2.51948E+04	2.38034E-02	2.07317E+06	4.93486E+04
2.69323E+04	2.20900E-02	1.84732E+06	4.08075E+04
2.86699E+04	2.19272E-02	1.62689E+06	3.56731E+04
3.04075E+04	2.05388E-02	1.41785E+06	2.91209E+04
3.21450E+04	1.92677E-02	1.22411E+06	2.35858E+04
3.38826E+04	1.84054E-02	1.04793E+06	1.92875E+04
3.56202E+04	1.79385E-02	8.90243E+05	1.59697E+04
3.73578E+04	1.79063E-02	7.51022E+05	1.34480E+04
3.90953E+04	1.84002E-02	6.29546E+05	1.15838E+04
4.08329E+04	1.98374E-02	5.24642E+05	1.04075E+04
4.25705E+04	2.17191E-02	4.34876E+05	9.44511E+03
4.43080E+04	2.57732E-02	3.58687E+05	9.24452E+03
4.60456E+04	3.34045E-02	2.94494E+05	9.83742E+03
4.77832E+04	4.50842E-02	2.40763E+05	1.08546E+04
4.95207E+04	6.29641E-02	1.96060E+05	1.23447E+04
5.12583E+04	9.73255E-02	1.59070E+05	1.54815E+04
5.29959E+04	1.46196E-01	1.28615E+05	1.88031E+04
5.47335E+04	2.27299E-01	1.03657E+05	2.35612E+04
5.64710E+04	3.73120E-01	8.32903E+04	3.10772E+04
5.82086E+04	5.90779E-01	6.67356E+04	3.94260E+04
5.99462E+04	8.77925E-01	5.33286E+04	4.68185E+04
6.16837E+04	9.35974E-01	4.25078E+04	3.97862E+04
6.34213E+04	9.80616E-01	3.38021E+04	3.31469E+04
6.51589E+04	1.10485E+00	2.68189E+04	2.96308E+04
6.68964E+04	1.32596E+00	2.12330E+04	2.81540E+04

J TOTAL = 2.55327E+09

PLANCK MEAN OPACITY = 3.68340E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 6.57417E-03
ROSSELAND MEAN-FREE-PATH = 3.75296E+01 1/ROSSELAND MEAN-FREE-PATH = 2.66456E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.56303E+03 I PRIME = 1.71516E+03

TEMPERATURE = 8.00000E+03 SI/H MASS RATIO = 5.00000E-02 PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	5.21837E-02	1.84809E+06	9.64404E+04
9.55663E+03	6.45851E-02	2.27081E+06	1.46660E+05
1.12942E+04	6.87863E-02	2.59042E+06	1.78186E+05
1.30318E+04	6.77494E-02	2.79800E+06	1.89563E+05
1.47693E+04	6.45694E-02	2.89737E+06	1.87081E+05
1.65069E+04	6.20606E-02	2.90059E+06	1.80012E+05
1.82445E+04	5.80194E-02	2.82424E+06	1.63860E+05
1.99821E+04	5.33311E-02	2.68647E+06	1.43273E+05
2.17196E+04	5.03613E-02	2.50506E+06	1.26158E+05
2.34572E+04	4.78461E-02	2.29608E+06	1.09858E+05
2.51948E+04	4.36302E-02	2.07317E+06	9.04530E+04
2.69323E+04	4.04444E-02	1.84732E+06	7.47140E+04
2.86699E+04	3.90612E-02	1.62689E+06	6.35484E+04
3.04075E+04	3.67597E-02	1.41785E+06	5.21196E+04
3.21450E+04	3.37708E-02	1.22411E+06	4.13392E+04
3.38826E+04	3.19036E-02	1.04793E+06	3.34327E+04
3.56202E+04	3.05413E-02	8.90243E+05	2.71891E+04
3.73578E+04	2.97016E-02	7.51022E+05	2.23065E+04
3.90953E+04	2.94771E-02	6.29546E+05	1.85572E+04
4.08329E+04	3.02661E-02	5.24642E+05	1.58789E+04
4.25705E+04	3.15560E-02	4.34876E+05	1.37230E+04
4.43080E+04	3.51211E-02	3.58687E+05	1.25975E+04
4.60456E+04	4.26015E-02	2.94494E+05	1.25459E+04
4.77832E+04	5.63817E-02	2.40763E+05	1.35746E+04
4.95207E+04	7.98424E-02	1.96060E+05	1.56539E+04
5.12583E+04	1.23455E-01	1.59070E+05	1.96380E+04
5.29959E+04	1.80322E-01	1.28615E+05	2.31921E+04
5.47335E+04	2.87639E-01	1.03657E+05	2.98158E+04
5.64710E+04	4.92205E-01	8.32903E+04	4.09959E+04
5.82086E+04	8.32100E-01	6.67356E+04	5.55307E+04
5.99462E+04	1.33358E+00	5.33286E+04	7.11181E+04
6.16837E+04	1.55867E+00	4.25078E+04	6.62559E+04
6.34213E+04	1.95317E+00	3.38021E+04	6.60213E+04
6.51589E+04	2.81446E+00	2.68189E+04	7.54807E+04
6.68964E+04	4.93556E+00	2.12330E+04	1.04797E+05

J TOTAL = 4.48566E+09

PLANCK MEAN OPACITY = 6.47111E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 3.13254E-02
ROSSELAND MEAN-FREE-PATH = 2.18353E+01 1/ROSSELAND MEAN-FREE-PATH = 4.57974E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 5.31009E+02 I PRIME = 6.12776E+02

TEMPERATURE = 8.00000E+03 SI/H MASS RATIO = 0. PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	2.34119E-01	1.84809E+06	4.32673E+05
9.55663E+03	2.83905E-01	2.27081E+06	6.44693E+05
1.12942E+04	2.99845E-01	2.59042E+06	7.76726E+05
1.30318E+04	2.93459E-01	2.79800E+06	8.21098E+05
1.47693E+04	2.77691E-01	2.89737E+06	8.04572E+05
1.65069E+04	2.58499E-01	2.90059E+06	7.49800E+05
1.82445E+04	2.38632E-01	2.82424E+06	6.73954E+05
1.99821E+04	2.18526E-01	2.68647E+06	5.87063E+05
2.17196E+04	2.02822E-01	2.50506E+06	5.08082E+05
2.34572E+04	1.87851E-01	2.29608E+06	4.31321E+05
2.51948E+04	1.75470E-01	2.07317E+06	3.63779E+05
2.69323E+04	1.64494E-01	1.84732E+06	3.03873E+05
2.86699E+04	1.61200E-01	1.62689E+06	2.62254E+05
3.04075E+04	1.53150E-01	1.41785E+06	2.17143E+05
3.21450E+04	1.48575E-01	1.22411E+06	1.81872E+05
3.38826E+04	1.48779E-01	1.04793E+06	1.55909E+05
3.56202E+04	1.56076E-01	8.90243E+05	1.38945E+05
3.73578E+04	1.70095E-01	7.51022E+05	1.27745E+05
3.90953E+04	1.92566E-01	6.29546E+05	1.21229E+05
4.08329E+04	2.32219E-01	5.24642E+05	1.21832E+05
4.25705E+04	2.79697E-01	4.34876E+05	1.21634E+05
4.43080E+04	3.69084E-01	3.58687E+05	1.32386E+05
4.60456E+04	5.27728E-01	2.94494E+05	1.55413E+05
4.77832E+04	7.57136E-01	2.40763E+05	1.82291E+05
4.95207E+04	1.09590E+00	1.96060E+05	2.14862E+05
5.12583E+04	1.74832E+00	1.59070E+05	2.78105E+05
5.29959E+04	2.69476E+00	1.28615E+05	3.46586E+05
5.47335E+04	4.20834E+00	1.03657E+05	4.36225E+05
5.64710E+04	6.87670E+00	8.32903E+04	5.72763E+05
5.82086E+04	1.07147E+01	6.67356E+04	7.15049E+05
5.99462E+04	1.55575E+01	5.33286E+04	8.29658E+05
6.16837E+04	1.60265E+01	4.25078E+04	6.81252E+05
6.34213E+04	1.54709E+01	3.38021E+04	5.22951E+05
6.51589E+04	1.48993E+01	2.68189E+04	3.99583E+05
6.68964E+04	1.14447E+01	2.12330E+04	2.43006E+05

J TOTAL = 2.47714E+10

PLANCK MEAN OPACITY = 3.57357E-01 MEAN-SQUARED PLANCK MEAN OPACITY = 1.45457E+00
ROSSELAND MEAN-FREE-PATH = 4.64777E+00 1/ROSSELAND MEAN-FREE-PATH = 2.15157E-01
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 2.42225E+01 I PRIME = 2.40343E+01

TEMPERATURE = 8.00000E+03 SI/H MASS RATIO = 5.00000E-03 PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	2.81296E-01	1.84809E+06	5.19861E+05
9.55663E+03	3.40943E-01	2.27081E+06	7.74216E+05
1.12942E+04	3.60195E-01	2.59042E+06	9.33059E+05
1.30318E+04	3.52634E-01	2.79800E+06	9.86668E+05
1.47693E+04	3.33663E-01	2.89737E+06	9.66743E+05
1.65069E+04	3.11673E-01	2.90059E+06	9.04038E+05
1.82445E+04	2.88105E-01	2.82424E+06	8.13677E+05
1.99821E+04	2.63903E-01	2.68647E+06	7.08967E+05
2.17196E+04	2.45379E-01	2.50506E+06	6.14691E+05
2.34572E+04	2.29235E-01	2.29608E+06	5.26342E+05
2.51948E+04	2.11982E-01	2.07317E+06	4.39476E+05
2.69323E+04	1.98206E-01	1.84732E+06	3.66152E+05
2.86699E+04	1.92710E-01	1.62689E+06	3.13517E+05
3.04075E+04	1.83376E-01	1.41785E+06	2.59998E+05
3.21450E+04	1.75001E-01	1.22411E+06	2.14220E+05
3.38826E+04	1.73345E-01	1.04793E+06	1.81653E+05
3.56202E+04	1.78977E-01	8.90243E+05	1.59333E+05
3.73578E+04	1.91503E-01	7.51022E+05	1.43823E+05
3.90953E+04	2.12645E-01	6.29546E+05	1.33870E+05
4.08329E+04	2.51092E-01	5.24642E+05	1.31733E+05
4.25705E+04	2.97474E-01	4.34876E+05	1.29364E+05
4.43080E+04	3.86007E-01	3.58687E+05	1.38456E+05
4.60456E+04	5.44409E-01	2.94494E+05	1.60325E+05
4.77832E+04	7.74757E-01	2.40763E+05	1.86533E+05
4.95207E+04	1.11694E+00	1.96060E+05	2.18986E+05
5.12583E+04	1.77584E+00	1.59070E+05	2.82482E+05
5.29959E+04	2.72677E+00	1.28615E+05	3.50704E+05
5.47335E+04	4.25512E+00	1.03657E+05	4.41073E+05
5.64710E+04	6.96151E+00	8.32903E+04	5.79826E+05
5.82086E+04	1.08794E+01	6.67356E+04	7.26046E+05
5.99462E+04	1.58632E+01	5.33286E+04	8.45961E+05
6.16837E+04	1.64428E+01	4.25078E+04	6.98949E+05
6.34213E+04	1.61197E+01	3.38021E+04	5.44878E+05
6.51589E+04	1.60378E+01	2.68189E+04	4.30116E+05
6.68964E+04	1.38466E+01	2.12330E+04	2.94005E+05

J TOTAL = 2.80092E+10

PLANCK MEAN OPACITY = 4.04066E-01 MEAN-SQUARED PLANCK MEAN OPACITY = 1.58809E+00
ROSSELAND MEAN-FREE-PATH = 3.93266E+00 1/ROSSELAND MEAN-FREE-PATH = 2.54281E-01
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.73032E+01 I PRIME = 1.75584E+01

TEMPERATURE = 8.00000E+03 SI/H MASS RATIO = 1.00000E-02 PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	3.23750E-01	1.84809E+06	5.98320E+05
9.55663E+03	3.92240E-01	2.27081E+06	8.90701E+05
1.12942E+04	4.14463E-01	2.59042E+06	1.07363E+06
1.30318E+04	4.05864E-01	2.79800E+06	1.13561E+06
1.47693E+04	3.84039E-01	2.89737E+06	1.11270E+06
1.65069E+04	3.59692E-01	2.90059E+06	1.04332E+06
1.82445E+04	3.32840E-01	2.82424E+06	9.40020E+05
1.99821E+04	3.04956E-01	2.68647E+06	8.19255E+05
2.17196E+04	2.83968E-01	2.50506E+06	7.11358E+05
2.34572E+04	2.67083E-01	2.29608E+06	6.13243E+05
2.51948E+04	2.45138E-01	2.07317E+06	5.08213E+05
2.69323E+04	2.28830E-01	1.84732E+06	4.22724E+05
2.86699E+04	2.21394E-01	1.62689E+06	3.60184E+05
3.04075E+04	2.11077E-01	1.41785E+06	2.99275E+05
3.21450E+04	1.99019E-01	1.22411E+06	2.43620E+05
3.38826E+04	1.95675E-01	1.04793E+06	2.05053E+05
3.56202E+04	1.99795E-01	8.90243E+05	1.77867E+05
3.73578E+04	2.10966E-01	7.51022E+05	1.58440E+05
3.90953E+04	2.30901E-01	6.29546E+05	1.45363E+05
4.08329E+04	2.68251E-01	5.24642E+05	1.40736E+05
4.25705E+04	3.13638E-01	4.34876E+05	1.36394E+05
4.43080E+04	4.01411E-01	3.58687E+05	1.43981E+05
4.60456E+04	5.59687E-01	2.94494E+05	1.64824E+05
4.77832E+04	7.91135E-01	2.40763E+05	1.90476E+05
4.95207E+04	1.13703E+00	1.96060E+05	2.22925E+05
5.12583E+04	1.80288E+00	1.59070E+05	2.86783E+05
5.29959E+04	2.75865E+00	1.28615E+05	3.54804E+05
5.47335E+04	4.30264E+00	1.03657E+05	4.45999E+05
5.64710E+04	7.04914E+00	8.32903E+04	5.87125E+05
5.82086E+04	1.10513E+01	6.67356E+04	7.37517E+05
5.99462E+04	1.61834E+01	5.33286E+04	8.63040E+05
6.16837E+04	1.68795E+01	4.25078E+04	7.17512E+05
6.34213E+04	1.68009E+01	3.38021E+04	5.67907E+05
6.51589E+04	1.72344E+01	2.68189E+04	4.62208E+05
6.68964E+04	1.63725E+01	2.12330E+04	3.47637E+05

J TOTAL = 3.09787E+10

PLANCK MEAN OPACITY = 4.46906E-01 MEAN-SQUARED PLANCK MEAN OPACITY = 1.73840E+00
ROSSELAND MEAN-FREE-PATH = 3.45683E+00 1/ROSSELAND MEAN-FREE-PATH = 2.89283E-01
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.33526E+01 I PRIME = 1.37768E+01

TEMPERATURE = 8.00000E+03 SI/H MASS RATIO = 5.00000E-02 PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	5.71506E-01	1.84809E+06	1.05620E+06
9.55663E+03	6.90977E-01	2.27081E+06	1.56907E+06
1.12942E+04	7.30338E-01	2.59042E+06	1.89188E+06
1.30318E+04	7.16173E-01	2.79800E+06	2.00385E+06
1.47693E+04	6.78236E-01	2.89737E+06	1.96510E+06
1.65069E+04	6.43209E-01	2.90059E+06	1.86569E+06
1.82445E+04	5.98126E-01	2.82424E+06	1.68925E+06
1.99821E+04	5.48828E-01	2.68647E+06	1.47441E+06
2.17196E+04	5.14859E-01	2.50506E+06	1.28976E+06
2.34572E+04	4.99701E-01	2.29608E+06	1.14735E+06
2.51948E+04	4.44443E-01	2.07317E+06	9.21407E+05
2.69323E+04	4.13135E-01	1.84732E+06	7.63193E+05
2.86699E+04	3.95220E-01	1.62689E+06	6.42980E+05
3.04075E+04	3.82493E-01	1.41785E+06	5.42316E+05
3.21450E+04	3.43857E-01	1.22411E+06	4.20918E+05
3.38826E+04	3.30376E-01	1.04793E+06	3.46210E+05
3.56202E+04	3.25434E-01	8.90243E+05	2.89715E+05
3.73578E+04	3.28454E-01	7.51022E+05	2.46676E+05
3.90953E+04	3.41129E-01	6.29546E+05	2.14757E+05
4.08329E+04	3.71877E-01	5.24642E+05	1.95103E+05
4.25705E+04	4.11266E-01	4.34876E+05	1.78850E+05
4.43080E+04	4.94758E-01	3.58687E+05	1.77463E+05
4.60456E+04	6.54087E-01	2.94494E+05	1.92624E+05
4.77832E+04	8.96861E-01	2.40763E+05	2.15931E+05
4.95207E+04	1.27670E+00	1.96060E+05	2.50310E+05
5.12583E+04	2.00449E+00	1.59070E+05	3.18853E+05
5.29959E+04	3.00393E+00	1.28615E+05	3.86351E+05
5.47335E+04	4.68480E+00	1.03657E+05	4.85613E+05
5.64710E+04	7.77889E+00	8.32903E+04	6.47907E+05
5.82086E+04	1.25095E+01	6.67356E+04	8.34829E+05
5.99462E+04	1.89233E+01	5.33286E+04	1.00915E+06
6.16837E+04	2.06249E+01	4.25078E+04	8.76719E+05
6.34213E+04	2.26565E+01	3.38021E+04	7.65836E+05
6.51589E+04	2.75354E+01	2.68189E+04	7.38469E+05
6.68964E+04	3.81384E+01	2.12330E+04	8.09793E+05

J TOTAL = 4.93896E+10

PLANCK MEAN OPACITY = 7.12505E-01 MEAN-SQUARED PLANCK MEAN OPACITY = 3.45838E+00
ROSSELAND MEAN-FREE-PATH = 2.02750E+00 1/ROSSELAND MEAN-FREE-PATH = 4.93217E-01
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 4.58567E+00 I PRIME = 5.03225E+00

TEMPERATURE = 8.00000E+03 SI/H MASS RATIO = 0. PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	6.26582E-01	1.84809E+06	1.15798E+06
9.55663E+03	7.41827E-01	2.27081E+06	1.68454E+06
1.12942E+04	7.76895E-01	2.59042E+06	2.01249E+06
1.30318E+04	7.57169E-01	2.79800E+06	2.11856E+06
1.47693E+04	7.13995E-01	2.89737E+06	2.06871E+06
1.65069E+04	6.64030E-01	2.90059E+06	1.92608E+06
1.82445E+04	6.12676E-01	2.82424E+06	1.73034E+06
1.99821E+04	5.61070E-01	2.68647E+06	1.50730E+06
2.17196E+04	5.21073E-01	2.50506E+06	1.30532E+06
2.34572E+04	4.83278E-01	2.29608E+06	1.10965E+06
2.51948E+04	4.52571E-01	2.07317E+06	9.38259E+05
2.69323E+04	4.26074E-01	1.84732E+06	7.87096E+05
2.86699E+04	4.15100E-01	1.62689E+06	6.75323E+05
3.04075E+04	3.97388E-01	1.41785E+06	5.63435E+05
3.21450E+04	3.89784E-01	1.22411E+06	4.77138E+05
3.38826E+04	3.97273E-01	1.04793E+06	4.16313E+05
3.56202E+04	4.27502E-01	8.90243E+05	3.80581E+05
3.73578E+04	4.78755E-01	7.51022E+05	3.59555E+05
3.90953E+04	5.56608E-01	6.29546E+05	3.50410E+05
4.08329E+04	6.89559E-01	5.24642E+05	3.61772E+05
4.25705E+04	8.47474E-01	4.34876E+05	3.68546E+05
4.43080E+04	1.14083E+00	3.58687E+05	4.09201E+05
4.60456E+04	1.65851E+00	2.94494E+05	4.88421E+05
4.77832E+04	2.40540E+00	2.40763E+05	5.79133E+05
4.95207E+04	3.50711E+00	1.96060E+05	6.87604E+05
5.12583E+04	5.62636E+00	1.59070E+05	8.94983E+05
5.29959E+04	8.69908E+00	1.28615E+05	1.11883E+06
5.47335E+04	1.36115E+01	1.03657E+05	1.41093E+06
5.64710E+04	2.22692E+01	8.32903E+04	1.85481E+06
5.82086E+04	3.47208E+01	6.67356E+04	2.31712E+06
5.99462E+04	5.04324E+01	5.33286E+04	2.68949E+06
6.16837E+04	5.19555E+01	4.25078E+04	2.20851E+06
6.34213E+04	5.01546E+01	3.38021E+04	1.69533E+06
6.51589E+04	4.83014E+01	2.68189E+04	1.29539E+06
6.68964E+04	3.70958E+01	2.12330E+04	7.87657E+05

J TOTAL = 7.07830E+10

PLANCK MEAN OPACITY = 1.02113E+00 MEAN-SQUARED PLANCK MEAN OPACITY = 1.50835E+01
ROSSELAND MEAN-FREE-PATH = 1.76216E+00 1/ROSSELAND MEAN-FREE-PATH = 5.67484E-01
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 3.50163E+00 I PRIME = 3.39244E+00

TEMPERATURE = 8.00000E+03 SI/H MASS RATIO = 5.00000E-03 PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	7.56409E-01	1.84809E+06	1.39791E+06
9.55663E+03	8.95153E-01	2.27081E+06	2.03272E+06
1.12942E+04	9.37660E-01	2.59042E+06	2.42894E+06
1.30318E+04	9.14116E-01	2.79800E+06	2.55769E+06
1.47693E+04	8.62017E-01	2.89737E+06	2.49758E+06
1.65069E+04	8.03980E-01	2.90059E+06	2.33202E+06
1.82445E+04	7.42583E-01	2.82424E+06	2.09723E+06
1.99821E+04	6.80082E-01	2.68647E+06	1.82702E+06
2.17196E+04	6.32465E-01	2.50506E+06	1.58437E+06
2.34572E+04	5.93874E-01	2.29608E+06	1.36358E+06
2.51948E+04	5.47865E-01	2.07317E+06	1.13582E+06
2.69323E+04	5.14044E-01	1.84732E+06	9.49606E+05
2.86699E+04	4.97782E-01	1.62689E+06	8.09837E+05
3.04075E+04	4.78347E-01	1.41785E+06	6.78223E+05
3.21450E+04	4.58620E-01	1.22411E+06	5.61401E+05
3.38826E+04	4.61246E-01	1.04793E+06	4.83352E+05
3.56202E+04	4.87119E-01	8.90243E+05	4.33655E+05
3.73578E+04	5.34468E-01	7.51022E+05	4.01397E+05
3.90953E+04	6.08847E-01	6.29546E+05	3.83297E+05
4.08329E+04	7.38637E-01	5.24642E+05	3.87520E+05
4.25705E+04	8.93688E-01	4.34876E+05	3.88644E+05
4.43080E+04	1.18497E+00	3.58687E+05	4.25035E+05
4.60456E+04	1.70274E+00	2.94494E+05	5.01447E+05
4.77832E+04	2.45151E+00	2.40763E+05	5.90234E+05
4.95207E+04	3.56095E+00	1.96060E+05	6.98160E+05
5.12583E+04	5.69620E+00	1.59070E+05	9.06092E+05
5.29959E+04	8.77788E+00	1.28615E+05	1.12897E+06
5.47335E+04	1.37177E+01	1.03657E+05	1.42194E+06
5.64710E+04	2.24578E+01	8.32903E+04	1.87052E+06
5.82086E+04	3.50836E+01	6.67356E+04	2.34132E+06
5.99462E+04	5.11028E+01	5.33286E+04	2.72524E+06
6.16837E+04	5.28687E+01	4.25078E+04	2.24733E+06
6.34213E+04	5.15787E+01	3.38021E+04	1.74347E+06
6.51589E+04	5.08021E+01	2.68189E+04	1.36246E+06
6.68964E+04	4.23748E+01	2.12330E+04	8.99744E+05

J TOTAL = 7.92224E+10

PLANCK MEAN OPACITY = 1.14288E+00 MEAN-SQUARED PLANCK MEAN OPACITY = 1.60203E+01
ROSSELAND MEAN-FREE-PATH = 1.48685E+00 1/ROSSELAND MEAN-FREE-PATH = 6.72564E-01
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 2.48461E+00 I PRIME = 2.46417E+00

TEMPERATURE = 8.00000E+03 SI/H MASS RATIO = 1.00000E-02 PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	8.71066E-01	1.84809E+06	1.60981E+06
9.55663E+03	1.03048E+00	2.27081E+06	2.34003E+06
1.12942E+04	1.07954E+00	2.59042E+06	2.79646E+06
1.30318E+04	1.05268E+00	2.79800E+06	2.94540E+06
1.47693E+04	9.92764E-01	2.89737E+06	2.87640E+06
1.65069E+04	9.27959E-01	2.90059E+06	2.69163E+06
1.82445E+04	8.57802E-01	2.82424E+06	2.42264E+06
1.99821E+04	7.85688E-01	2.68647E+06	2.11073E+06
2.17196E+04	7.31518E-01	2.50506E+06	1.83250E+06
2.34572E+04	6.93433E-01	2.29608E+06	1.59218E+06
2.51948E+04	6.32702E-01	2.07317E+06	1.31170E+06
2.69323E+04	5.92391E-01	1.84732E+06	1.09434E+06
2.86699E+04	5.71657E-01	1.62689E+06	9.30024E+05
3.04075E+04	5.51424E-01	1.41785E+06	7.81834E+05
3.21450E+04	5.19954E-01	1.22411E+06	6.36480E+05
3.38826E+04	5.18250E-01	1.04793E+06	5.43088E+05
3.56202E+04	5.40246E-01	8.90243E+05	4.80950E+05
3.73578E+04	5.84118E-01	7.51022E+05	4.38686E+05
3.90953E+04	6.55403E-01	6.29546E+05	4.12606E+05
4.08329E+04	7.82374E-01	5.24642E+05	4.10467E+05
4.25705E+04	9.34872E-01	4.34876E+05	4.06554E+05
4.43080E+04	1.22438E+00	3.58687E+05	4.39169E+05
4.60456E+04	1.74258E+00	2.94494E+05	5.13180E+05
4.77832E+04	2.49361E+00	2.40763E+05	6.00369E+05
4.95207E+04	3.61140E+00	1.96060E+05	7.08049E+05
5.12583E+04	5.76358E+00	1.59070E+05	9.16810E+05
5.29959E+04	8.85488E+00	1.28615E+05	1.13887E+06
5.47335E+04	1.38235E+01	1.03657E+05	1.43290E+06
5.64710E+04	2.26494E+01	8.32903E+04	1.88647E+06
5.82086E+04	3.54564E+01	6.67356E+04	2.36620E+06
5.99462E+04	5.17956E+01	5.33286E+04	2.76219E+06
6.16837E+04	5.38138E+01	4.25078E+04	2.28751E+06
6.34213E+04	5.30545E+01	3.38021E+04	1.79335E+06
6.51589E+04	5.33963E+01	2.68189E+04	1.43203E+06
6.68964E+04	4.78546E+01	2.12330E+04	1.01610E+06

J TOTAL = 8.68050E+10

PLANCK MEAN OPACITY = 1.25227E+00 MEAN-SQUARED PLANCK MEAN OPACITY = 1.70377E+01
ROSSELAND MEAN-FREE-PATH = 1.30774E+00 1/ROSSELAND MEAN-FREE-PATH = 7.64678E-01
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.91828E+00 I PRIME = 1.93531E+00

TEMPERATURE = 8.00000E+03 SI/H MASS RATIO = 5.00000E-02 PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.52962E+00	1.84809E+06	2.82688E+06
9.55663E+03	1.80631E+00	2.27081E+06	4.10178E+06
1.12942E+04	1.89248E+00	2.59042E+06	4.90233E+06
1.30318E+04	1.84793E+00	2.79800E+06	5.17051E+06
1.47693E+04	1.74430E+00	2.89737E+06	5.05387E+06
1.65069E+04	1.64713E+00	2.90059E+06	4.77766E+06
1.82445E+04	1.52865E+00	2.82424E+06	4.31726E+06
1.99821E+04	1.40150E+00	2.68647E+06	3.76510E+06
2.17196E+04	1.31289E+00	2.50506E+06	3.28888E+06
2.34572E+04	1.29950E+00	2.29608E+06	2.98377E+06
2.51948E+04	1.13244E+00	2.07317E+06	2.34775E+06
2.69323E+04	1.05448E+00	1.84732E+06	1.94797E+06
2.86699E+04	1.01165E+00	1.62689E+06	1.64584E+06
3.04075E+04	9.99943E-01	1.41785E+06	1.41777E+06
3.21450E+04	8.82242E-01	1.22411E+06	1.07996E+06
3.38826E+04	8.55045E-01	1.04793E+06	8.96025E+05
3.56202E+04	8.54248E-01	8.90243E+05	7.60488E+05
3.73578E+04	8.77634E-01	7.51022E+05	6.59123E+05
3.90953E+04	9.30658E-01	6.29546E+05	5.85892E+05
4.08329E+04	1.04098E+00	5.24642E+05	5.46141E+05
4.25705E+04	1.17840E+00	4.34876E+05	5.12458E+05
4.43080E+04	1.45856E+00	3.58687E+05	5.23167E+05
4.60456E+04	1.98592E+00	2.94494E+05	5.84841E+05
4.77832E+04	2.76041E+00	2.40763E+05	6.64606E+05
4.95207E+04	3.95360E+00	1.96060E+05	7.75141E+05
5.12583E+04	6.25391E+00	1.59070E+05	9.94807E+05
5.29959E+04	9.43119E+00	1.28615E+05	1.21299E+06
5.47335E+04	1.46479E+01	1.03657E+05	1.51836E+06
5.64710E+04	2.42026E+01	8.32903E+04	2.01584E+06
5.82086E+04	3.85445E+01	6.67356E+04	2.57229E+06
5.99462E+04	5.75913E+01	5.33286E+04	3.07126E+06
6.16837E+04	6.17441E+01	4.25078E+04	2.62461E+06
6.34213E+04	6.54708E+01	3.38021E+04	2.21305E+06
6.51589E+04	7.52621E+01	2.68189E+04	2.01845E+06
6.68964E+04	9.40983E+01	2.12330E+04	1.99799E+06

J TOTAL = 1.32707E+11

PLANCK MEAN OPACITY = 1.91445E+00 MEAN-SQUARED PLANCK MEAN OPACITY = 2.75278E+01
ROSSELAND MEAN-FREE-PATH = 7.74973E-01 1/ROSSELAND MEAN-FREE-PATH = 1.29037E+00
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 6.71099E-01 I PRIME = 7.21632E-01

TEMPERATURE = 1.00000E+04 SI/H MASS RATIO = 0. PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	9.97694E-02	2.73687E+06	2.73056E+05
9.55663E+03	1.14525E-01	3.51758E+06	4.02852E+05
1.12942E+04	1.14589E-01	4.20701E+06	4.82075E+05
1.30318E+04	1.10976E-01	4.77425E+06	5.29827E+05
1.47693E+04	1.10196E-01	5.20408E+06	5.73471E+05
1.65069E+04	1.00828E-01	5.49347E+06	5.53894E+05
1.82445E+04	9.21961E-02	5.64844E+06	5.20764E+05
1.99821E+04	8.37578E-02	5.68123E+06	4.75847E+05
2.17196E+04	7.70621E-02	5.60789E+06	4.32156E+05
2.34572E+04	7.09466E-02	5.44634E+06	3.86399E+05
2.51948E+04	6.56714E-02	5.21487E+06	3.42468E+05
2.69323E+04	6.06682E-02	4.93104E+06	2.99157E+05
2.86699E+04	7.69488E-02	4.61095E+06	3.54807E+05
3.04075E+04	7.19136E-02	4.26879E+06	3.06984E+05
3.21450E+04	6.77582E-02	3.91660E+06	2.65382E+05
3.38826E+04	6.28871E-02	3.56430E+06	2.24149E+05
3.56202E+04	5.80437E-02	3.21973E+06	1.86885E+05
3.73578E+04	5.42297E-02	2.88886E+06	1.56662E+05
3.90953E+04	5.20580E-02	2.57595E+06	1.34099E+05
4.08329E+04	5.09824E-02	2.28388E+06	1.16438E+05
4.25705E+04	5.09500E-02	2.01430E+06	1.02628E+05
4.43080E+04	5.29110E-02	1.76792E+06	9.35423E+04
4.60456E+04	5.82427E-02	1.54469E+06	8.99670E+04
4.77832E+04	6.70092E-02	1.34401E+06	9.00607E+04
4.95207E+04	7.81925E-02	1.16484E+06	9.10815E+04
5.12583E+04	9.99320E-02	1.00588E+06	1.00519E+05
5.29959E+04	1.28926E-01	8.65656E+05	1.11605E+05
5.47335E+04	1.72177E-01	7.42604E+05	1.27860E+05
5.64710E+04	2.43738E-01	6.35134E+05	1.54806E+05
5.82086E+04	3.35513E-01	5.41686E+05	1.81743E+05
5.99462E+04	4.36310E-01	4.60760E+05	2.01034E+05
6.16837E+04	4.10913E-01	3.90942E+05	1.60643E+05
6.34213E+04	3.62331E-01	3.30917E+05	1.19901E+05
6.51589E+04	3.21218E-01	2.79480E+05	8.97740E+04
6.68964E+04	2.32861E-01	2.35536E+05	5.48471E+04

J TOTAL = 1.52687E+10

PLANCK MEAN OPACITY = 8.86572E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 1.03102E-02
ROSSELAND MEAN-FREE-PATH = 1.34053E+01 1/ROSSELAND MEAN-FREE-PATH = 7.45972E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.98518E+02 I PRIME = 2.03889E+02

TEMPERATURE = 1.00000E+04 SI/H MASS RATIO = 5.00000E-03 PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.02011E-01	2.73687E+06	2.79190E+05
9.55663E+03	1.16982E-01	3.51758E+06	4.11495E+05
1.12942E+04	1.17125E-01	4.20701E+06	4.92746E+05
1.30318E+04	1.13492E-01	4.77425E+06	5.41838E+05
1.47693E+04	1.12695E-01	5.20408E+06	5.86472E+05
1.65069E+04	1.03763E-01	5.49347E+06	5.70016E+05
1.82445E+04	9.51133E-02	5.64844E+06	5.37242E+05
1.99821E+04	8.65010E-02	5.68123E+06	4.91432E+05
2.17196E+04	7.98868E-02	5.60789E+06	4.47996E+05
2.34572E+04	7.37410E-02	5.44634E+06	4.01618E+05
2.51948E+04	6.82107E-02	5.21487E+06	3.55710E+05
2.69323E+04	6.30205E-02	4.93104E+06	3.10757E+05
2.86699E+04	7.91389E-02	4.61095E+06	3.64906E+05
3.04075E+04	7.39524E-02	4.26879E+06	3.15687E+05
3.21450E+04	6.96392E-02	3.91660E+06	2.72749E+05
3.38826E+04	6.46412E-02	3.56430E+06	2.30400E+05
3.56202E+04	5.96861E-02	3.21973E+06	1.92173E+05
3.73578E+04	5.57697E-02	2.88886E+06	1.61111E+05
3.90953E+04	5.35062E-02	2.57595E+06	1.37829E+05
4.08329E+04	5.23489E-02	2.28388E+06	1.19558E+05
4.25705E+04	5.22405E-02	2.01430E+06	1.05228E+05
4.43080E+04	5.41330E-02	1.76792E+06	9.57028E+04
4.60456E+04	5.94322E-02	1.54469E+06	9.18043E+04
4.77832E+04	6.85028E-02	1.34401E+06	9.20682E+04
4.95207E+04	8.01913E-02	1.16484E+06	9.34097E+04
5.12583E+04	1.02622E-01	1.00588E+06	1.03225E+05
5.29959E+04	1.32400E-01	8.65656E+05	1.14613E+05
5.47335E+04	1.77965E-01	7.42604E+05	1.32157E+05
5.64710E+04	2.54060E-01	6.35134E+05	1.61362E+05
5.82086E+04	3.54274E-01	5.41686E+05	1.91906E+05
5.99462E+04	4.68654E-01	4.60760E+05	2.15937E+05
6.16837E+04	4.54626E-01	3.90942E+05	1.77732E+05
6.34213E+04	4.26688E-01	3.30917E+05	1.41198E+05
6.51589E+04	4.23430E-01	2.79480E+05	1.18340E+05
6.68964E+04	4.12059E-01	2.35536E+05	9.70547E+04

J TOTAL = 1.59034E+10

PLANCK MEAN OPACITY = 9.23425E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 1.17506E-02
ROSSELAND MEAN-FREE-PATH = 1.30023E+01 1/ROSSELAND MEAN-FREE-PATH = 7.69094E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.87268E+02 I PRIME = 1.92640E+02

TEMPERATURE = 1.00000E+04 SI/H MASS RATIO = 1.00000E-02 PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.04253E-01	2.73687E+06	2.85327E+05
9.55663E+03	1.19438E-01	3.51758E+06	4.20133E+05
1.12942E+04	1.19660E-01	4.20701E+06	5.03409E+05
1.30318E+04	1.16006E-01	4.77425E+06	5.53843E+05
1.47693E+04	1.15194E-01	5.20408E+06	5.99480E+05
1.65069E+04	1.06711E-01	5.49347E+06	5.86213E+05
1.82445E+04	9.80473E-02	5.64844E+06	5.53814E+05
1.99821E+04	8.92609E-02	5.68123E+06	5.07111E+05
2.17196E+04	8.27328E-02	5.60789E+06	4.63956E+05
2.34572E+04	7.65590E-02	5.44634E+06	4.16966E+05
2.51948E+04	7.07709E-02	5.21487E+06	3.69061E+05
2.69323E+04	6.53922E-02	4.93104E+06	3.22452E+05
2.86699E+04	8.13474E-02	4.61095E+06	3.75089E+05
3.04075E+04	7.60085E-02	4.26879E+06	3.24464E+05
3.21450E+04	7.15362E-02	3.91660E+06	2.80178E+05
3.38826E+04	6.64102E-02	3.56430E+06	2.36706E+05
3.56202E+04	6.13427E-02	3.21973E+06	1.97507E+05
3.73578E+04	5.73229E-02	2.88886E+06	1.65598E+05
3.90953E+04	5.49669E-02	2.57595E+06	1.41592E+05
4.08329E+04	5.37272E-02	2.28388E+06	1.22706E+05
4.25705E+04	5.35423E-02	2.01430E+06	1.07850E+05
4.43080E+04	5.53658E-02	1.76792E+06	9.78822E+04
4.60456E+04	6.06325E-02	1.54469E+06	9.36586E+04
4.77832E+04	7.00144E-02	1.34401E+06	9.40998E+04
4.95207E+04	8.22193E-02	1.16484E+06	9.57720E+04
5.12583E+04	1.05357E-01	1.00588E+06	1.05976E+05
5.29959E+04	1.35936E-01	8.65656E+05	1.17674E+05
5.47335E+04	1.83863E-01	7.42604E+05	1.36537E+05
5.64710E+04	2.64588E-01	6.35134E+05	1.68049E+05
5.82086E+04	3.73417E-01	5.41686E+05	2.02275E+05
5.99462E+04	5.01663E-01	4.60760E+05	2.31147E+05
6.16837E+04	4.99240E-01	3.90942E+05	1.95174E+05
6.34213E+04	4.92375E-01	3.30917E+05	1.62935E+05
6.51589E+04	5.27759E-01	2.79480E+05	1.47498E+05
6.68964E+04	5.94974E-01	2.35536E+05	1.40138E+05

J TOTAL = 1.65456E+10

PLANCK MEAN OPACITY = 9.60715E-02 MEAN-SQUARED PLANCK MEAN OPACITY = 1.35039E-02
ROSSELAND MEAN-FREE-PATH = 1.26279E+01 1/ROSSELAND MEAN-FREE-PATH = 7.91900E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.76952E+02 I PRIME = 1.82387E+02

TEMPERATURE = 1.00000E+04 SI/H MASS RATIO = 5.00000E-02 PRESSURE = 1.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.22282E-01	2.73687E+06	3.34671E+05
9.55663E+03	1.39092E-01	3.51758E+06	4.89267E+05
1.12942E+04	1.39916E-01	4.20701E+06	5.88629E+05
1.30318E+04	1.36135E-01	4.77425E+06	6.49942E+05
1.47693E+04	1.35291E-01	5.20408E+06	7.04065E+05
1.65069E+04	1.30848E-01	5.49347E+06	7.18811E+05
1.82445E+04	1.22179E-01	5.64844E+06	6.90120E+05
1.99821E+04	1.11995E-01	5.68123E+06	6.36270E+05
2.17196E+04	1.06321E-01	5.60789E+06	5.96234E+05
2.34572E+04	1.00002E-01	5.44634E+06	5.44646E+05
2.51948E+04	9.20480E-02	5.21487E+06	4.80018E+05
2.69323E+04	8.51068E-02	4.93104E+06	4.19666E+05
2.86699E+04	9.97150E-02	4.61095E+06	4.59781E+05
3.04075E+04	9.31208E-02	4.26879E+06	3.97513E+05
3.21450E+04	8.73228E-02	3.91660E+06	3.42008E+05
3.38826E+04	8.11346E-02	3.56430E+06	2.89188E+05
3.56202E+04	7.51342E-02	3.21973E+06	2.41912E+05
3.73578E+04	7.02569E-02	2.88886E+06	2.02962E+05
3.90953E+04	6.71321E-02	2.57595E+06	1.72929E+05
4.08329E+04	6.52094E-02	2.28388E+06	1.48930E+05
4.25705E+04	6.43889E-02	2.01430E+06	1.29698E+05
4.43080E+04	6.56385E-02	1.76792E+06	1.16043E+05
4.60456E+04	7.06497E-02	1.54469E+06	1.09132E+05
4.77832E+04	8.27793E-02	1.34401E+06	1.11256E+05
4.95207E+04	9.95272E-02	1.16484E+06	1.15933E+05
5.12583E+04	1.28873E-01	1.00588E+06	1.29631E+05
5.29959E+04	1.66489E-01	8.65656E+05	1.44122E+05
5.47335E+04	2.35102E-01	7.42604E+05	1.74588E+05
5.64710E+04	3.56347E-01	6.35134E+05	2.26328E+05
5.82086E+04	5.40559E-01	5.41686E+05	2.92814E+05
5.99462E+04	7.90112E-01	4.60760E+05	3.64053E+05
6.16837E+04	8.89208E-01	3.90942E+05	3.47629E+05
6.34213E+04	1.06667E+00	3.30917E+05	3.52978E+05
6.51589E+04	1.44004E+00	2.79480E+05	4.02462E+05
6.68964E+04	2.19461E+00	2.35536E+05	5.16910E+05

J TOTAL = 2.19649E+10

PLANCK MEAN OPACITY = 1.27538E-01 MEAN-SQUARED PLANCK MEAN OPACITY = 4.10100E-02
ROSSELAND MEAN-FREE-PATH = 1.02335E+01 1/ROSSELAND MEAN-FREE-PATH = 9.77187E-02
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.17084E+02 I PRIME = 1.22241E+02

TEMPERATURE = 1.00000E+04 SI/H MASS RATIO = 0. PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.02061E+00	2.73687E+06	2.79327E+06
9.55663E+03	1.16140E+00	3.51758E+06	4.08533E+06
1.12942E+04	1.18433E+00	4.20701E+06	4.98248E+06
1.30318E+04	1.15121E+00	4.77425E+06	5.49617E+06
1.47693E+04	1.11326E+00	5.20408E+06	5.79348E+06
1.65069E+04	1.03044E+00	5.49347E+06	5.66069E+06
1.82445E+04	9.49362E-01	5.64844E+06	5.36241E+06
1.99821E+04	8.68244E-01	5.68123E+06	4.93269E+06
2.17196E+04	8.04199E-01	5.60789E+06	4.50986E+06
2.34572E+04	7.43786E-01	5.44634E+06	4.05091E+06
2.51948E+04	6.92171E-01	5.21487E+06	3.60958E+06
2.69323E+04	6.43554E-01	4.93104E+06	3.17339E+06
2.86699E+04	7.00609E-01	4.61095E+06	3.23048E+06
3.04075E+04	6.55958E-01	4.26879E+06	2.80014E+06
3.21450E+04	6.22364E-01	3.91660E+06	2.43755E+06
3.38826E+04	5.92549E-01	3.56430E+06	2.11202E+06
3.56202E+04	5.73403E-01	3.21973E+06	1.84621E+06
3.73578E+04	5.64736E-01	2.88886E+06	1.63144E+06
3.90953E+04	5.78239E-01	2.57595E+06	1.48952E+06
4.08329E+04	6.03171E-01	2.28388E+06	1.37757E+06
4.25705E+04	6.47295E-01	2.01430E+06	1.30384E+06
4.43080E+04	7.31611E-01	1.76792E+06	1.29343E+06
4.60456E+04	8.88348E-01	1.54469E+06	1.37222E+06
4.77832E+04	1.12226E+00	1.34401E+06	1.50833E+06
4.95207E+04	1.41250E+00	1.16484E+06	1.64533E+06
5.12583E+04	1.95127E+00	1.00588E+06	1.96274E+06
5.29959E+04	2.65688E+00	8.65656E+05	2.29994E+06
5.47335E+04	3.69461E+00	7.42604E+05	2.74363E+06
5.64710E+04	5.38821E+00	6.35134E+05	3.42224E+06
5.82086E+04	7.55346E+00	5.41686E+05	4.09161E+06
5.99462E+04	9.93070E+00	4.60760E+05	4.57567E+06
6.16837E+04	9.34949E+00	3.90942E+05	3.65511E+06
6.34213E+04	8.22347E+00	3.30917E+05	2.72129E+06
6.51589E+04	7.27116E+00	2.79480E+05	2.03214E+06
6.68964E+04	5.21047E+00	2.35536E+05	1.22725E+06

J TOTAL = 1.86320E+11

PLANCK MEAN OPACITY = 1.08186E+00 MEAN-SQUARED PLANCK MEAN OPACITY = 2.65155E+00
ROSSELAND MEAN-FREE-PATH = 1.22367E+00 1/ROSSELAND MEAN-FREE-PATH = 8.17215E-01
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.70466E+00 I PRIME = 1.60168E+00

TEMPERATURE = 1.00000E+04 SI/H MASS RATIO = 5.00000E-03 PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.05358E+00	2.73687E+06	2.88350E+06
9.55663E+03	1.19804E+00	3.51758E+06	4.21421E+06
1.12942E+04	1.22222E+00	4.20701E+06	5.14188E+06
1.30318E+04	1.18848E+00	4.77425E+06	5.67411E+06
1.47693E+04	1.14934E+00	5.20408E+06	5.98123E+06
1.65069E+04	1.06849E+00	5.49347E+06	5.86973E+06
1.82445E+04	9.86049E-01	5.64844E+06	5.56964E+06
1.99821E+04	9.02392E-01	5.68123E+06	5.12669E+06
2.17196E+04	8.37926E-01	5.60789E+06	4.69899E+06
2.34572E+04	7.76659E-01	5.44634E+06	4.22995E+06
2.51948E+04	7.21893E-01	5.21487E+06	3.76458E+06
2.69323E+04	6.71061E-01	4.93104E+06	3.30903E+06
2.86699E+04	7.26245E-01	4.61095E+06	3.34868E+06
3.04075E+04	6.79954E-01	4.26879E+06	2.90258E+06
3.21450E+04	6.44202E-01	3.91660E+06	2.52308E+06
3.38826E+04	6.12892E-01	3.56430E+06	2.18453E+06
3.56202E+04	5.92414E-01	3.21973E+06	1.90741E+06
3.73578E+04	5.82535E-01	2.88886E+06	1.68286E+06
3.90953E+04	5.94951E-01	2.57595E+06	1.53257E+06
4.08329E+04	6.18905E-01	2.28388E+06	1.41350E+06
4.25705E+04	6.62125E-01	2.01430E+06	1.33372E+06
4.43080E+04	7.45655E-01	1.76792E+06	1.31826E+06
4.60456E+04	9.01978E-01	1.54469E+06	1.39328E+06
4.77832E+04	1.13781E+00	1.34401E+06	1.52922E+06
4.95207E+04	1.43147E+00	1.16484E+06	1.66743E+06
5.12583E+04	1.97520E+00	1.00588E+06	1.98681E+06
5.29959E+04	2.68597E+00	8.65656E+05	2.32513E+06
5.47335E+04	3.73946E+00	7.42604E+05	2.77693E+06
5.64710E+04	5.46531E+00	6.35134E+05	3.47120E+06
5.82086E+04	7.69097E+00	5.41686E+05	4.16609E+06
5.99462E+04	1.01658E+01	4.60760E+05	4.68399E+06
6.16837E+04	9.66686E+00	3.90942E+05	3.77918E+06
6.34213E+04	8.69040E+00	3.30917E+05	2.87580E+06
6.51589E+04	8.01219E+00	2.79480E+05	2.23924E+06
6.68964E+04	6.50909E+00	2.35536E+05	1.53313E+06

J TOTAL = 1.92937E+11

PLANCK MEAN OPACITY = 1.12028E+00 MEAN-SQUARED PLANCK MEAN OPACITY = 2.86213E+00
ROSSELAND MEAN-FREE-PATH = 1.18383E+00 1/ROSSELAND MEAN-FREE-PATH = 8.44718E-01
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.59482E+00 I PRIME = 1.50563E+00

TEMPERATURE = 1.00000E+04 SI/H MASS RATIO = 1.00000E-02 PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.08616E+00	2.73687E+06	2.97267E+06
9.55663E+03	1.23422E+00	3.51758E+06	4.34148E+06
1.12942E+04	1.25963E+00	4.20701E+06	5.29926E+06
1.30318E+04	1.22529E+00	4.77425E+06	5.84983E+06
1.47693E+04	1.18499E+00	5.20408E+06	6.16678E+06
1.65069E+04	1.10623E+00	5.49347E+06	6.07703E+06
1.82445E+04	1.02247E+00	5.64844E+06	5.77536E+06
1.99821E+04	9.36304E-01	5.68123E+06	5.31935E+06
2.17196E+04	8.71471E-01	5.60789E+06	4.88711E+06
2.34572E+04	8.09396E-01	5.44634E+06	4.40824E+06
2.51948E+04	7.51477E-01	5.21487E+06	3.91885E+06
2.69323E+04	6.98442E-01	4.93104E+06	3.44405E+06
2.86699E+04	7.51769E-01	4.61095E+06	3.46637E+06
3.04075E+04	7.03855E-01	4.26879E+06	3.00461E+06
3.21450E+04	6.65947E-01	3.91660E+06	2.60825E+06
3.38826E+04	6.33148E-01	3.56430E+06	2.25673E+06
3.56202E+04	6.11345E-01	3.21973E+06	1.96837E+06
3.73578E+04	6.00260E-01	2.88886E+06	1.73406E+06
3.90953E+04	6.11594E-01	2.57595E+06	1.57544E+06
4.08329E+04	6.34576E-01	2.28388E+06	1.44929E+06
4.25705E+04	6.76896E-01	2.01430E+06	1.36347E+06
4.43080E+04	7.59644E-01	1.76792E+06	1.34299E+06
4.60456E+04	9.15563E-01	1.54469E+06	1.41426E+06
4.77832E+04	1.15336E+00	1.34401E+06	1.55013E+06
4.95207E+04	1.45053E+00	1.16484E+06	1.68963E+06
5.12583E+04	1.99932E+00	1.00588E+06	2.01108E+06
5.29959E+04	2.71536E+00	8.65656E+05	2.35057E+06
5.47335E+04	3.78491E+00	7.42604E+05	2.81069E+06
5.64710E+04	5.54361E+00	6.35134E+05	3.52094E+06
5.82086E+04	7.83080E+00	5.41686E+05	4.24184E+06
5.99462E+04	1.04050E+01	4.60760E+05	4.79420E+06
6.16837E+04	9.98985E+00	3.90942E+05	3.90545E+06
6.34213E+04	9.16569E+00	3.30917E+05	3.03308E+06
6.51589E+04	8.76658E+00	2.79480E+05	2.45008E+06
6.68964E+04	7.83124E+00	2.35536E+05	1.84454E+06

J TOTAL = 1.99553E+11

PLANCK MEAN OPACITY = 1.15870E+00 MEAN-SQUARED PLANCK MEAN OPACITY = 3.09145E+00
ROSSELAND MEAN-FREE-PATH = 1.14686E+00 1/ROSSELAND MEAN-FREE-PATH = 8.71945E-01
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.49617E+00 I PRIME = 1.41887E+00

TEMPERATURE = 1.00000E+04 SI/H MASS RATIO = 5.00000E-02 PRESSURE = 5.00000E+02

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	1.33499E+00	2.73687E+06	3.65370E+06
9.55663E+03	1.50955E+00	3.51758E+06	5.30997E+06
1.12942E+04	1.54400E+00	4.20701E+06	6.49560E+06
1.30318E+04	1.50542E+00	4.77425E+06	7.18727E+06
1.47693E+04	1.45720E+00	5.20408E+06	7.58340E+06
1.65069E+04	1.39850E+00	5.49347E+06	7.68262E+06
1.82445E+04	1.30577E+00	5.64844E+06	7.37555E+06
1.99821E+04	1.20048E+00	5.68123E+06	6.82019E+06
2.17196E+04	1.13443E+00	5.60789E+06	6.36174E+06
2.34572E+04	1.06734E+00	5.44634E+06	5.81307E+06
2.51948E+04	9.84063E-01	5.21487E+06	5.13176E+06
2.69323E+04	9.13766E-01	4.93104E+06	4.50582E+06
2.86699E+04	9.52673E-01	4.61095E+06	4.39273E+06
3.04075E+04	8.92308E-01	4.26879E+06	3.80907E+06
3.21450E+04	8.37171E-01	3.91660E+06	3.27886E+06
3.38826E+04	7.92678E-01	3.56430E+06	2.82534E+06
3.56202E+04	7.60486E-01	3.21973E+06	2.44856E+06
3.73578E+04	7.39929E-01	2.88886E+06	2.13755E+06
3.90953E+04	7.42761E-01	2.57595E+06	1.91332E+06
4.08329E+04	7.58106E-01	2.28388E+06	1.73142E+06
4.25705E+04	7.93352E-01	2.01430E+06	1.59805E+06
4.43080E+04	8.69965E-01	1.76792E+06	1.53803E+06
4.60456E+04	1.02295E+00	1.54469E+06	1.58015E+06
4.77832E+04	1.27811E+00	1.34401E+06	1.71779E+06
4.95207E+04	1.60587E+00	1.16484E+06	1.87058E+06
5.12583E+04	2.19868E+00	1.00588E+06	2.21161E+06
5.29959E+04	2.96044E+00	8.65656E+05	2.56273E+06
5.47335E+04	4.16840E+00	7.42604E+05	3.09547E+06
5.64710E+04	6.20945E+00	6.35134E+05	3.94384E+06
5.82086E+04	9.02518E+00	5.41686E+05	4.88882E+06
5.99462E+04	1.24526E+01	4.60760E+05	5.73769E+06
6.16837E+04	1.27568E+01	3.90942E+05	4.98716E+06
6.34213E+04	1.32396E+01	3.30917E+05	4.38122E+06
6.51589E+04	1.52357E+01	2.79480E+05	4.25806E+06
6.68964E+04	1.91725E+01	2.35536E+05	4.51581E+06

J TOTAL = 2.52546E+11

PLANCK MEAN OPACITY = 1.46640E+00 MEAN-SQUARED PLANCK MEAN OPACITY = 5.67620E+00
ROSSELAND MEAN-FREE-PATH = 9.23758E-01 1/ROSSELAND MEAN-FREE-PATH = 1.08253E+00
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 9.68548E-01 I PRIME = 9.44790E-01

TEMPERATURE = 1.00000E+04 SI/H MASS RATIO = 0. PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	2.75983E+00	2.73687E+06	7.55328E+06
9.55663E+03	3.10929E+00	3.51758E+06	1.09372E+07
1.12942E+04	3.17530E+00	4.20701E+06	1.33585E+07
1.30318E+04	3.08417E+00	4.77425E+06	1.47246E+07
1.47693E+04	2.96001E+00	5.20408E+06	1.54041E+07
1.65069E+04	2.74662E+00	5.49347E+06	1.50885E+07
1.82445E+04	2.53470E+00	5.64844E+06	1.43171E+07
1.99821E+04	2.32214E+00	5.68123E+06	1.31926E+07
2.17196E+04	2.15526E+00	5.60789E+06	1.20864E+07
2.34572E+04	1.99725E+00	5.44634E+06	1.08777E+07
2.51948E+04	1.86360E+00	5.21487E+06	9.71844E+06
2.69323E+04	1.73878E+00	4.93104E+06	8.57400E+06
2.86699E+04	1.82141E+00	4.61095E+06	8.39845E+06
3.04075E+04	1.71115E+00	4.26879E+06	7.30454E+06
3.21450E+04	1.63451E+00	3.91660E+06	6.40171E+06
3.38826E+04	1.57871E+00	3.56430E+06	5.62700E+06
3.56202E+04	1.56556E+00	3.21973E+06	5.04068E+06
3.73578E+04	1.58343E+00	2.88886E+06	4.57430E+06
3.90953E+04	1.67450E+00	2.57595E+06	4.31343E+06
4.08329E+04	1.80028E+00	2.28388E+06	4.11163E+06
4.25705E+04	1.99381E+00	2.01430E+06	4.01613E+06
4.43080E+04	2.33208E+00	1.76792E+06	4.12292E+06
4.60456E+04	2.93502E+00	1.54469E+06	4.53371E+06
4.77832E+04	3.82156E+00	1.34401E+06	5.13621E+06
4.95207E+04	4.91683E+00	1.16484E+06	5.72730E+06
5.12583E+04	6.93367E+00	1.00588E+06	6.97443E+06
5.29959E+04	9.56651E+00	8.65656E+05	8.28130E+06
5.47335E+04	1.34286E+01	7.42604E+05	9.97215E+06
5.64710E+04	1.97158E+01	6.35134E+05	1.25222E+07
5.82086E+04	2.77492E+01	5.41686E+05	1.50313E+07
5.99462E+04	3.65686E+01	4.60760E+05	1.68493E+07
6.16837E+04	3.44252E+01	3.90942E+05	1.34583E+07
6.34213E+04	3.02620E+01	3.30917E+05	1.00142E+07
6.51589E+04	2.67414E+01	2.79480E+05	7.47368E+06
6.68964E+04	1.91132E+01	2.35536E+05	4.50184E+06

J TOTAL = 5.56403E+11

PLANCK MEAN OPACITY = 3.23074E+00 MEAN-SQUARED PLANCK MEAN OPACITY = 3.15483E+01
ROSSELAND MEAN-FREE-PATH = 4.40783E-01 1/ROSSELAND MEAN-FREE-PATH = 2.26869E+00
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 2.24443E-01 I PRIME = 2.02680E-01

TEMPERATURE = 1.00000E+04 SI/H MASS RATIO = 5.00000E-03 PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	2.85877E+00	2.73687E+06	7.82408E+06
9.55663E+03	3.21872E+00	3.51758E+06	1.13221E+07
1.12942E+04	3.28812E+00	4.20701E+06	1.38332E+07
1.30318E+04	3.19475E+00	4.77425E+06	1.52525E+07
1.47693E+04	3.06631E+00	5.20408E+06	1.59573E+07
1.65069E+04	2.85567E+00	5.49347E+06	1.56875E+07
1.82445E+04	2.63892E+00	5.64844E+06	1.49058E+07
1.99821E+04	2.41884E+00	5.68123E+06	1.37420E+07
2.17196E+04	2.24963E+00	5.60789E+06	1.26156E+07
2.34572E+04	2.08928E+00	5.44634E+06	1.13789E+07
2.51948E+04	1.94623E+00	5.21487E+06	1.01493E+07
2.69323E+04	1.81523E+00	4.93104E+06	8.95098E+06
2.86699E+04	1.89279E+00	4.61095E+06	8.72756E+06
3.04075E+04	1.77838E+00	4.26879E+06	7.59151E+06
3.21450E+04	1.69504E+00	3.91660E+06	6.63879E+06
3.38826E+04	1.63507E+00	3.56430E+06	5.82788E+06
3.56202E+04	1.61819E+00	3.21973E+06	5.21014E+06
3.73578E+04	1.63268E+00	2.88886E+06	4.71657E+06
3.90953E+04	1.72070E+00	2.57595E+06	4.43245E+06
4.08329E+04	1.84375E+00	2.28388E+06	4.21089E+06
4.25705E+04	2.03474E+00	2.01430E+06	4.09856E+06
4.43080E+04	2.37086E+00	1.76792E+06	4.19148E+06
4.60456E+04	2.97276E+00	1.54469E+06	4.59200E+06
4.77832E+04	3.86321E+00	1.34401E+06	5.19218E+06
4.95207E+04	4.96596E+00	1.16484E+06	5.78453E+06
5.12583E+04	6.99426E+00	1.00588E+06	7.03537E+06
5.29959E+04	9.63774E+00	8.65656E+05	8.34296E+06
5.47335E+04	1.35332E+01	7.42604E+05	1.00498E+07
5.64710E+04	1.98921E+01	6.35134E+05	1.26341E+07
5.82086E+04	2.80603E+01	5.41686E+05	1.51999E+07
5.99462E+04	3.70984E+01	4.60760E+05	1.70935E+07
6.16837E+04	3.51407E+01	3.90942E+05	1.37380E+07
6.34213E+04	3.13152E+01	3.30917E+05	1.03627E+07
6.51589E+04	2.84132E+01	2.79480E+05	7.94091E+06
6.68964E+04	2.20435E+01	2.35536E+05	5.19202E+06

J TOTAL = 5.74134E+11

PLANCK MEAN OPACITY = 3.33369E+00 MEAN-SQUARED PLANCK MEAN OPACITY = 3.32484E+01
ROSSELAND MEAN-FREE-PATH = 4.25889E-01 1/ROSSELAND MEAN-FREE-PATH = 2.34803E+00
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 2.09286E-01 I PRIME = 1.90032E-01

TEMPERATURE = 1.00000E+04 SI/H MASS RATIO = 1.00000E-02 PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	2.95598E+00	2.73687E+06	8.09013E+06
9.55663E+03	3.32615E+00	3.51758E+06	1.17000E+07
1.12942E+04	3.39885E+00	4.20701E+06	1.42990E+07
1.30318E+04	3.30331E+00	4.77425E+06	1.57708E+07
1.47693E+04	3.17074E+00	5.20408E+06	1.65008E+07
1.65069E+04	2.96312E+00	5.49347E+06	1.62778E+07
1.82445E+04	2.74171E+00	5.64844E+06	1.54864E+07
1.99821E+04	2.51425E+00	5.68123E+06	1.42840E+07
2.17196E+04	2.34286E+00	5.60789E+06	1.31385E+07
2.34572E+04	2.18035E+00	5.44634E+06	1.18749E+07
2.51948E+04	2.02791E+00	5.21487E+06	1.05753E+07
2.69323E+04	1.89082E+00	4.93104E+06	9.32370E+06
2.86699E+04	1.96338E+00	4.61095E+06	9.05306E+06
3.04075E+04	1.84491E+00	4.26879E+06	7.87551E+06
3.21450E+04	1.75491E+00	3.91660E+06	6.87326E+06
3.38826E+04	1.69081E+00	3.56430E+06	6.02657E+06
3.56202E+04	1.67025E+00	3.21973E+06	5.37775E+06
3.73578E+04	1.68139E+00	2.88886E+06	4.85730E+06
3.90953E+04	1.76641E+00	2.57595E+06	4.55019E+06
4.08329E+04	1.88674E+00	2.28388E+06	4.30909E+06
4.25705E+04	2.07522E+00	2.01430E+06	4.18012E+06
4.43080E+04	2.40922E+00	1.76792E+06	4.25930E+06
4.60456E+04	3.01013E+00	1.54469E+06	4.64973E+06
4.77832E+04	3.90460E+00	1.34401E+06	5.24781E+06
4.95207E+04	5.01500E+00	1.16484E+06	5.84165E+06
5.12583E+04	7.05498E+00	1.00588E+06	7.09646E+06
5.29959E+04	9.70933E+00	8.65656E+05	8.40494E+06
5.47335E+04	1.36388E+01	7.42604E+05	1.01282E+07
5.64710E+04	2.00704E+01	6.35134E+05	1.27474E+07
5.82086E+04	2.83757E+01	5.41686E+05	1.53708E+07
5.99462E+04	3.76359E+01	4.60760E+05	1.73411E+07
6.16837E+04	3.58668E+01	3.90942E+05	1.40218E+07
6.34213E+04	3.23843E+01	3.30917E+05	1.07165E+07
6.51589E+04	3.01104E+01	2.79480E+05	8.41526E+06
6.68964E+04	2.50188E+01	2.35536E+05	5.89282E+06

J TOTAL = 5.91743E+11

PLANCK MEAN OPACITY = 3.43594E+00 MEAN-SQUARED PLANCK MEAN OPACITY = 3.50500E+01
ROSSELAND MEAN-FREE-PATH = 4.12192E-01 1/ROSSELAND MEAN-FREE-PATH = 2.42605E+00
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.95834E-01 I PRIME = 1.78732E-01

TEMPERATURE = 1.00000E+04 SI/H MASS RATIO = 5.00000E-02 PRESSURE = 1.00000E+03

OMEGA	TOTAL MU	B(W,T)	J
7.81906E+03	3.68247E+00	2.73687E+06	1.00784E+07
9.55663E+03	4.12639E+00	3.51758E+06	1.45149E+07
1.12942E+04	4.22287E+00	4.20701E+06	1.77657E+07
1.30318E+04	4.11207E+00	4.77425E+06	1.96321E+07
1.47693E+04	3.95070E+00	5.20408E+06	2.05598E+07
1.65069E+04	3.77569E+00	5.49347E+06	2.07417E+07
1.82445E+04	3.52206E+00	5.64844E+06	1.98941E+07
1.99821E+04	3.23955E+00	5.68123E+06	1.84046E+07
2.17196E+04	3.05578E+00	5.60789E+06	1.71365E+07
2.34572E+04	2.88092E+00	5.44634E+06	1.56905E+07
2.51948E+04	2.65426E+00	5.21487E+06	1.38416E+07
2.69323E+04	2.47056E+00	4.93104E+06	1.21825E+07
2.86699E+04	2.50550E+00	4.61095E+06	1.15528E+07
3.04075E+04	2.35718E+00	4.26879E+06	1.00623E+07
3.21450E+04	2.21465E+00	3.91660E+06	8.67389E+06
3.38826E+04	2.11897E+00	3.56430E+06	7.55263E+06
3.56202E+04	2.07022E+00	3.21973E+06	6.66556E+06
3.73578E+04	2.05573E+00	2.88886E+06	5.93871E+06
3.90953E+04	2.11770E+00	2.57595E+06	5.45509E+06
4.08329E+04	2.21724E+00	2.28388E+06	5.06390E+06
4.25705E+04	2.38647E+00	2.01430E+06	4.80706E+06
4.43080E+04	2.70425E+00	1.76792E+06	4.78090E+06
4.60456E+04	3.29840E+00	1.54469E+06	5.09501E+06
4.77832E+04	4.22845E+00	1.34401E+06	5.68307E+06
4.95207E+04	5.40533E+00	1.16484E+06	6.29632E+06
5.12583E+04	7.54610E+00	1.00588E+06	7.59046E+06
5.29959E+04	1.02942E+01	8.65656E+05	8.91123E+06
5.47335E+04	1.45132E+01	7.42604E+05	1.07776E+07
5.64710E+04	2.15636E+01	6.35134E+05	1.36957E+07
5.82086E+04	3.10331E+01	5.41686E+05	1.68102E+07
5.99462E+04	4.21784E+01	4.60760E+05	1.94341E+07
6.16837E+04	4.20093E+01	3.90942E+05	1.64232E+07
6.34213E+04	4.14359E+01	3.30917E+05	1.37119E+07
6.51589E+04	4.44894E+01	2.79480E+05	1.24339E+07
6.68964E+04	5.02361E+01	2.35536E+05	1.18324E+07

J TOTAL = 7.29241E+11

PLANCK MEAN OPACITY = 4.23431E+00 MEAN-SQUARED PLANCK MEAN OPACITY = 5.33730E+01
ROSSELAND MEAN-FREE-PATH = 3.31863E-01 1/ROSSELAND MEAN-FREE-PATH = 3.01329E+00
MEAN-SQUARED ROSSELAND MEAN-FREE-PATH = 1.26208E-01 I PRIME = 1.18918E-01

APPENDIX E

NEW TECHNOLOGY AND PATENTS

After a diligent review of the work performed under this contract, NAS 3-13461, it has been determined by The KMS Technology Center that no new innovation, discovery, improvement, or invention was made during the course of the work performed, and that no patentable items can result from this work.

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